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State of Connecticut
State Geological and Natural History Survey
BULLETIN NO. 34

309

GUIDE

TO THE

INSECTS OF CONNECTICUT

PREPARED UNDER THE DIRECTION OF

WILTON EVERETT BRITTON, PH.D.

State Entomologist and Entomologist of the Connecticut Agricultural Experiment Station

PART IV

The Hemiptera or Sucking Insects
of Connecticut

93

By

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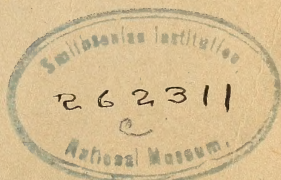
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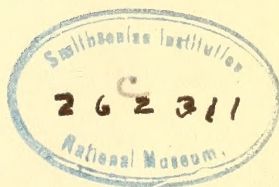
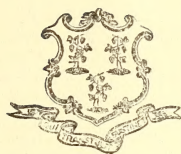


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H. H. ROBINSON, Superintendent

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Hemiptera of Connecticut.

INTRODUCTION.

The name of this order—Hemiptera—comes from the Greek, *hemi*, meaning half, and *pteron*, a wing, on account of the basal half of the wing being thickened, in many species, with the terminal half transparent and membranous.

The order Hemiptera of the early works on classification, and as considered by the earlier entomologists, included practically all of those insects with sucking mouthparts, having incomplete transformations. Forms of great diversity and even greater habits were thus brought together in one order. Some modern writers now make three orders in place of one, namely, Parasitica, Homoptera and Hemiptera.

In these Bulletins of the State Geological and Natural History Survey, it was deemed best not to complicate the classification features to such an extent as to discourage teachers and pupils who are expected to make much use of these publications. Entomologists will understand, I think, that the old arrangement is given in this publication for the sake of simplicity and because the order Hemiptera in the key to orders in Bulletin No. 16, page 34, included all its subdivisions, and not because the present writer claims to be an authority on classification.

Geologically, the evidence seems to show that the Hemiptera date from the Paleozoic age, and that probably the Homoptera appeared at an earlier date than the Heteroptera. As regards other orders of insects, both the Odonata (dragonflies) and the Orthoptera (grasshoppers, crickets, etc.) are older than the Hemiptera.

All species of the Hemiptera (*sensu latior*) have mouthparts fitted for sucking their food.

All species have incomplete transformations. There is no true pupa stage, though in the families Psyllidae, Aleyrodidae, and in the males of Coccidae, there is something most nearly approaching it. With most families the nymphs hatching from the eggs gradually increase in size and change slightly in passing through their molting stages until they reach the adult form.

Most of the scale insects, or Coccidae, Aleyrodidae and part of the Psyllidae, are non-motile during the greater portion of their lives and are fixed upon their food plants. Galls are formed by some of the Psyllids, particularly those occurring on hackberry, and by some of the aphids.

Most of the species of Hemiptera probably have only one generation each year. Some of the leaf-hoppers have two or more, the San José Scale (Coccidae) has two broods in Connecticut, and tropical or semitropical species of Coccidae occurring on plants in greenhouses probably breed continuously without regard to season. The life histories of many species are not well-known and some are entirely unknown.

Undoubtedly the aphids exceed all other species of insects in the number of annual generations. Though the winter is usually passed in the egg stage, some species winter as adults. Of other species as many as thirteen generations are known to occur in a single season, most of these being born alive (viviparous) without the intervention of males. This habit enables them to multiply very rapidly and consequently they are among the most important pests of cultivated plants.

Several writers have pointed out that no order of insects has been more neglected by entomologists or is more directly connected with the welfare of the human race than the Hemiptera. The Parasitica all live upon mammals, sucking their blood, and include some of the most important pests of man and the domestic animals. The Homoptera all suck the juices from the leaves or twigs of plants, many species being markedly injurious. Thus the members of the family Cicadellidae feed upon the leaves and are known as "leaf-hoppers," those of the Membracidae feed upon the stems and twigs and are called "tree-hoppers," the Fulgoridae or "lantern flies" are usually on the stems or leaves of herbaceous plants or shrubs. The Cercopidae, known as "frog-hoppers" or "spittle insects," make frothy masses on the stems of grasses or the twigs of trees and shrubs. The members of the Cicadidae, or "harvest flies," are larger than those of the families just mentioned and apparently with all the species the immature forms are subterranean and feed upon the roots of trees: the adults suck sap from twigs and branches, and lay their eggs in them. The best-known and most destructive species in this family is the "periodical cicada" or "seventeen-year locust." The Psyllids, or "jumping plant lice," occur on the stems and leaves of woody plants, and only a few species are considered as pests. The Aphids, or "plant lice," are very abundant as regards species and individuals and are common to nearly every plant species. They are usually found on the under surface of the leaves or on the tender shoots, often doing great damage. The Aleyrodids, or "white flies," are few in number of species, and occur on the under side of leaves. Only two or three species in our range are considered of economic importance. The Coccidae, or "scale insects," occur on the bark and leaves of trees, the stems and leaves of herbaceous plants and shrubs, and certain species are found in the nests of ants: they are fairly abundant and include a number of important pests.

The Hemiptera, or Heteroptera, include a number of families like the Tingidae or "lace bugs," Miridae or "leaf bugs," Lygaeidae, Coreidae and Neididae, the members of which feed upon plant tissues, and certain species are well-known and important pests. Other families like the Reduviidae or "assassin bugs," Phymatidae or "ambush bugs," Nabidae or "damsel bugs," Veliidae or "water striders," Belostomatidae or "giant water bugs," Corixidae, "water boatmen," Notonectidae, "back swimmers," and it is believed the Aradidae or "flat bugs," are predatory on insects and other small animals. The Cimicidae or "bed bugs," attack warm blood animals. Other families like the Pentatomidae or "stink bugs," contain certain species which are plant feeders, while others are predatory upon insects.

Though the insects of most of the families are terrestrial, the species of Veliidae, Nepidae, Saldidae, Nerthridae, Belostomatidae, Corixidae and Notonectidae are aquatic.

In general the plant-feeding species, as well as those attacking the higher animals, are regarded as injurious, while the predatory species are called beneficial because they attack and destroy many individuals of noxious species. But they are perhaps just as apt to devour harmless or even beneficial species, should such be at hand. From certain species of Coccidae in the Orient is obtained the lac of commerce, and certain other species of the same family formerly supplied the brilliant red dye, cochineal. Thus the Hemiptera as a whole contains many species which are considered injurious, and some beneficial ones: few or none are parasitic on other insects, though many are predatory.

The numbers of individuals in the Hemiptera are greatly reduced, and in fact the species often held in check, by parasites and natural enemies. Hymenopterous, Dipterous and even Lepidopterous insects are known to parasitize the Hemiptera. The larvae of Coleoptera, especially Coccinellidae or lady beetles, devour vast quantities of aphids and scale insects. The larvae of Syrphid flies (Diptera) and lace-wing flies (Neuroptera) also feed upon aphids.

Some 20,000 species of Hemiptera have been described over the whole world; there are about 5,000 species in North America and over 870 species are known to occur in Connecticut. In number of species, the order is exceeded, at least in Connecticut, only by the Coleoptera (beetles), Lepidoptera (butterflies and moths), Hymenoptera (ants, bees and wasps), and possibly by the Diptera (flies).

The sequence of the families in this work follows in reverse order that of Van Duzee's Catalogue of Hemiptera, 1917, which so far is the most complete arrangement of the order in this country. Though there are various opinions in regard to special groups, it has seemed best to the Editor to follow this, the most available and authoritative arrangement, leaving it to specialists to settle elsewhere any controverted points.

STATISTICS.

Statistics of the Connecticut Hemiptera given in this bulletin are as follows:

Suborder	Family	Number of Genera.	Number of Species and Varieties.	
			Listed.	Recorded from Connecticut.
Parasitica	Haematomyzidae	1	1	0
	Pediculidae	3	3	3
	Haematopinidae	8	16	5
	Echinophthiridae	2	2	0
Homoptera	Fulgoridae	32	108	51
	Cicadellidae	47	266	192
	Membracidae	22	77	71
	Cercopidae	6	41	12
	Cicadidae	3	9	7
	Psyllidae	8	26	19
	Aphididae	65	234	95
	Aleyrodidae	5	12	10
	Coccidae	27	86	53
Heteroptera	Corixidae	4	14	10
	Ochteridae	1	2	0
	Nerthridae	1	2	0
	Belostomatidae	3	7	5
	Nepidae	2	4	2
	Naucoridae	1	1	1
	Notonectidae	3	10	5
	Saldidae	5	20	9
	Veliidae	3	22	1
	Gerridae	5	13	7
	Hydrometridae	1	1	0
	Miridae (Capsidae)	83	403	149
	Teratophylidae	1	1	0
	Anthocoridae	5	6	2
	Cimicidae	2	3	2
	Nabidae	2	11	6
	Mesoveliidae	1	1	1
	Naeogetidae (Hebridae)	2	3	1
	Reduviidae	23	35	14
	Phymatidae	1	2	2
	Enicocephalidae	1	1	0
	Piesmidae	1	1	1
	Tingidae	13	32	21
	Lygaeidae	36	53	42
	Neididae	2	2	2
	Aradidae	4	32	8
	Coreidae	7	11	8
	Alydidae	5	7	4
	Corizidae	2	6	3
	Pentatomidae	29	47	39
	Cydnidae	6	10	7
	Scutelleridae	2	2	2
Total		486	1,646	872

EXPLANATION OF COLLECTORS' INITIALS.

- W. E. B.—W. E. Britton, State and Station Entomologist, Agricultural Experiment Station, New Haven, Conn. Author of a portion of this Bulletin. Has collected in nearly all parts of the State.
- A. I. B.—Arthur I. Bourne, Assistant Entomologist, Agricultural Experiment Station, Amherst, Mass. In 1909, was assistant in Entomology, Agricultural Experiment Station at New Haven. Collected around New Haven.
- P. L. B.—Philip L. Buttrick, Assistant Professor of Forestry, Michigan Agricultural College, East Lansing, Mich. In 1904 and 1906 was employed temporarily as Assistant in Entomology, Agricultural Experiment Station, New Haven. Has collected around New Haven.
- K. F. C.—Kenyon F. Chamberlain, Cornwall, Conn. Employed as Assistant in Entomology, Agricultural Experiment Station at New Haven in 1918 and 1919. Has collected in various parts of the State, but chiefly around Cornwall and New Haven.
- A. B. C.—Alfred B. Champlain, Bureau of Plant Industry, Harrisburg, Pa. Assistant in Entomology, Agricultural Experiment Station, New Haven, in 1910 and 1911. Has collected in different parts of the State, but particularly around New Haven and Lyme.
- D. J. C.—Donald J. Caffrey, European Corn Borer Laboratory, U. S. Bureau of Entomology, Arlington, Mass. From 1910 to 1913 Assistant Entomologist, Agricultural Experiment Station, New Haven. Collected chiefly around Wallingford and Stonington.
- I. W. D.—Irving W. Davis, Assistant Entomologist, Agricultural Experiment Station, New Haven, Deputy in Charge of Gipsy Moth Work, 1913 to 1920. Resides in Danielson. Has collected mostly in Windham and New London Counties.
- D. M. D.—Dwight M. DeLong, Bureau of Plant Industry, Harrisburg, Pa. Author of the Cicadellidae of this Bulletin. Collected around New Haven, when in the Army Laboratory School in 1918.
- E. L. D.—E. L. Dickerson, Nutley, N. J., formerly Assistant in Entomology, Agricultural Experiment Station, New Brunswick, N. J. Has collected in Brookfield, Conn.
- C. R. E.—Charles R. Ely, Washington, D. C. Has collected at East River, where he spends his summer vacations.
- P. G.—Philip Garman, Assistant Entomologist, Agricultural Experiment Station, New Haven, Conn.
- J. A. H.—James A. Hyslop, U. S. Bureau of Entomology, Washington, D. C. Employed on gipsy moth work at Stonington in 1906.

- G. H. H.—George H. Hollister, Superintendent Keney Park, Hartford, formerly in charge of gipsy moth work, Agricultural Experiment Station, New Haven. Collected around Stonington.
- C. W. J.—Charles W. Johnson, Boston Society of Natural History, Boston, Mass. Has collected in various parts of Connecticut.
- H. L. J.—Harry L. Johnson, South Meriden, a collector of Coleoptera and other insects. Has collected around Meriden.
- H. B. K.—Harry B. Kirk, Bureau of Plant Industry, Harrisburg, Pa. Assistant in Entomology, Agricultural Experiment Station, New Haven, 1912. Collected around New Haven, Lyme and Stamford.
- F. H. L.—F. H. Lathrop, Assistant Entomologist, Agricultural Experiment Station, Corvallis, Oregon. Collected around New Haven while in the Army Laboratory School.
- J. K. L.—John Kirby Lewis, New Haven. Employed temporarily at different times as Assistant in Entomology, Agricultural Experiment Station. Has collected in various parts of the State.
- Q. S. L.—Quincy S. Lowry, Canton, Mass. From 1913 to 1918 was Assistant Entomologist, Agricultural Experiment Station, New Haven. Has collected in various parts of the State, but more particularly around New Haven.
- W. M.—Werner Marchand, Rockefeller Institute for Medical Research, Princeton, N. J.
- E. J. S. M.—E. J. S. Moore, New Haven. Employed temporarily as Assistant in Entomology, Agricultural Experiment Station in 1902. Collected around New Haven.
- A. P. M.—Albert P. Morse, Curator of Zoological Museum, Wellesley, Mass. A student of Orthoptera. Has collected in various parts of the State.
- H. M. P.—Howard M. Parshley, Associate Professor of Zoology, Smith College, Northampton, Mass. A specialist in Hemiptera, and one of the authors of this Bulletin. Has collected at a few points in the State.
- L. B. R.—L. Bradford Ripley, Glastonbury, employed temporarily in 1914 as Assistant in Entomology, Agricultural Experiment Station, New Haven.
- H. L. V.—Henry L. Viereck, Bureau of Biological Survey, Washington, D. C. In 1904 and 1905 was Assistant in Entomology, Agricultural Experiment Station, New Haven. A student of Hymenoptera and the author of Hymenoptera of Connecticut (Bulletin No. 22). Has collected in all parts of the State but more especially along the coast.
- B. H. W.—Benjamin H. Walden, Assistant Entomologist, Agricultural Experiment Station, New Haven. Author of Orthoptera of Connecticut (Bulletin No. 16). Has collected in all parts of the State.
- H. W. W.—Henry W. Winkley, formerly of Branford, where he did most of his collecting.

- L. B. W.—Lewis B. Woodruff, Brooklyn, N. Y. Summers at Litchfield, Conn., and has collected insects in that vicinity.
- W. C. W.—William C. Woods, Professor of Biology, Wesleyan University, Middletown. Has collected around Middletown.
- M. P. Z.—Max P. Zappe, Assistant Entomologist, Agricultural Experiment Station, New Haven. Has collected in nearly all parts of the State.

AUTHORSHIP.

The preparation of this bulletin has been made possible by the coöperation of a number of entomologists, fifteen in all, who will be recognized as authorities in their special fields. Of the original authors, one or two found themselves over-burdened with official duties, and were obliged to relinquish a part of the program which they had undertaken, and new men had to be procured.

An effort has been made to secure as much uniformity of treatment as possible, and each author was furnished a brief outline of instructions, most of which were followed. In general, however, it seemed best to sacrifice uniformity, rather than individuality, and no real attempt has been made to harmonize the treatment in the different families.

In the following list, each author is responsible for the manuscript of the family opposite his or her name.

Parasitica by Herbert Osborn, D.Sc., Professor of Zoology and Entomology, Ohio State University, Columbus, Ohio.

Fulgoridae by Edward Payson Van Duzee, Curator, Department of Entomology, California Academy of Sciences, San Francisco, Cal.

Cicadellidae by Dwight Moore DeLong, Ph.D., Assistant Professor of Entomology, Ohio State University, Columbus, Ohio.

Membracidae by William Delbert Funkhouser, Ph.D., Professor of Zoology, University of Kentucky, Lexington, Ky.

Cercopidae by Louis Agassiz Stearns, M.Sc., Associate Entomologist, Virginia State Crop Pest Commission, Blacksburg, Va.

Cicadidae by William Thompson Davis, New Brighton, Staten Island, N. Y.

Psyllidae } by Edith Marion Patch, Ph.D., Entomologist, Agricultural Experiment Station, Orono, Me.
Aphididae }

Tribe **Lachnini**. By Harley Frost Wilson, M.S., Professor of Economic Entomology, University of Wisconsin, Madison, Wis.

Tribe **Callipterini**. By Arthur Challen Baker, Ph.D., Entomological Assistant, Bureau of Entomology, Washington, D. C.

Books given under each species title to Connecticut unless otherwise indicated. [] placed in brackets.

Subfamily **Pemphiginae**. By Asa Chandler Maxson, Head of the Great Western Sugar Company Experiment Station, Longmont, Col.

Aleyrodidae } by Wilton Everett Britton, Ph.D., State Entomologist and Entomologist Agricultural
Coccidae } Experiment Station, New Haven, Conn.

Corixidae by James Francis Abbott, Ph.D., Professor of Zoology, Washington University, St. Louis, Mo.

Miridae by Harry Hazleton Knight, Ph.D., Assistant Entomologist, Agricultural Experiment Station, University Farm, St. Paul, Minn.

Lygaeidae by Harry Gardner Barber, A.M., Roselle Park, N. J.

Ochtheridae }
Nerthridae }
Belostomatidae }
Nepidae }
Naucoridae }
Notonectidae }
Saldidae } by José Rollin de la Torre-Bueno, F. E. S.,
Veliidae } General Chemical Co., New York, N. Y.
Gerridae }
Hydrometridae }
Mesoveliidae }
Naeoegidae }
Reduviidae }

Aradidae }
Termtophylidae }
Anthocoridae }
Cicmicidae }
Nabidae }
Phymatidae }
Enicocephalidae }
Piesmidae } by Howard Madison Parshley, Sc.D., Associate Professor of Zoology, Smith College, Northampton, Mass.
Tingidae }
Neididae }
Coreidae }
Alydidae }
Corizidae }
Pentatomidae }
Cydnidae }
Scutelleridae }

In this work on the Hemiptera of Connecticut, one hundred and twenty-seven (127) species and varieties are described as new, not all being from Connecticut, and most of them in the family Miridae.

The asterisk (*) precedes each species and variety which was described originally from Connecticut.

Families and genera in the keys not occurring within the range of this paper are placed in brackets, [].

Records given under each species refer to Connecticut unless otherwise indicated.

Order HEMIPTERA.

(Sub Class Rhynchota.)

Key to Suborders.

- | | |
|--|---------------------|
| 1. Wings usually present | 2 |
| Wings absent; beak fleshy and without segments (parasitic on man and other mammals) | Parasitica, p. 17 |
| 2. Wings of uniform texture; usually arched or roof-like over back and sides of body; beak attached to, or produced from, the hind part of the lower side of the head; head closely joined to the prothorax with the sides resting on the bases of the fore-legs | Homoptera, p. 23 |
| Wings not of uniform texture; thickened at the base with the tips thin and membranous; the fore wings when folded lying flat upon the back with the tips overlapping; beak attached to the front part of the head; head usually separated from the prothorax by a more or less distinct neck | Heteroptera, p. 383 |

Suborder Parasitica.

By HERBERT OSBORN, D.Sc.

The insects of this group are wingless parasitic forms occurring only on mammals. They are entirely suctorial in mouth structure and depend upon sucking the blood of the host animals for their food supply. The antennae have from three to five segments; the eyes may be greatly reduced or wanting; there are no traces of wings and the legs are modified especially for clasping, being adapted to clinging to the hairs of the host animals.

The species are among the most pernicious pests of man and domestic animals; some of the species are a special menace as carriers of disease, the most notable perhaps being the body louse of man which transmits typhus fever.

The American species have been treated by the writer in *Insects Affecting Domestic Animals*,¹ and a much more recent paper by Kellogg and Ferris² gives a quite full discussion of American species but with more especial reference to the species occurring on wild animals. The writer has drawn upon their paper for records and especially for help in the construction of the keys for the present paper.

Most of the characters used in classification are minute and require examination with the microscope, and it is usually most convenient to have specimens mounted on glass slides in canada balsam.

¹ *Insects Affecting Domestic Animals*, Bull. No. 5, n. s. Div. Ent. U. S. Dept. Agriculture, 1896.

² The Anoplura and Mallophaga of North American Mammals. Leland Stanford Junior Univ. Publications. Univ. Series, 1915.

Key to Families.

1. Occurs on marine animals onlyECHINOPTHRIDAE, p. 23
Occurs on land mammals only 2
2. Head much elongated; occurs on the elephant
HAEMATOMYZIDAE, p. 18
Head not exceptionally elongated 3
3. Eyes present and conspicuousPEDICULIDAE, p. 18
Eyes rudimentary or wantingHAEMATOPINIDAE, p. 19

Family HAEMATOMYZIDAE.

This family includes but one genus and one known species which occurs on the elephant.

Haematomyzus elephantis Piaget. *proboscideus* Piaget. Elephant louse.

Tijds. v. Ent. iv, Ser. 2, 254, 1869.

This species has a remarkably elongate head with presumably especially elongate sucking tube for the penetration of the thick hide of its host the elephant. While no records have been made of its occurrence in Connecticut the presence of its host as an occasional visitor at least should make its collection possible.

Family PEDICULIDAE.

This family includes species which have conspicuous eyes. They occur on man, the apes and monkeys, and are not known from other animals.

Key to Subfamilies and Genera.

1. Antennae five segmentedPEDICULINAE 2
Antennae three segmentedPEDICINAE 3
2. All legs of equal sizePediculus, p. 18
Front legs smaller than middle and hindPhthirus, p. 19
3. All legs of equal sizePedicinus, p. 19
Fore legs smaller than middle and hind[Phthirpedicinus]

Pediculus Linnaeus.

These are elongate in form with the legs of nearly equal size.

P. capitis (DeGeer). Head louse of man. (Pl. i, 1.)

Mem. Hist. Ins., 7, 67, 1778.

This is the common head louse, whitish in color, which clings to the hair of the head and fastens its eggs or nits on the hair, most commonly back of the ears. Still abundant in places in spite of the efforts of sanitarians.

From Steamer Richard Peck, New Haven, 1 Oct., 1910 (B. H. W.), New Haven, 15 Aug., 1911 (A. B. C.); Storrs, 1914 (J. A. Manter).

P. corporis (DeGeer). Cootie, or body louse of man. (Pl. i, 2.)

Mem. Hist. Ins., 7, 67, 1778.

The body louse found mainly in the clothing is notorious as a pest in prisons, barracks, armies and where sanitation is difficult; particularly obnoxious as the carrier of typhus fever.

New Haven, 1917. (J. S. Miller.)

Phthirius Leach.

Broad and crab-like in form with the front legs smaller than the middle and hind pairs.

P. pubis (Linnaeus). Crab-louse of man. (Pl. i, 8.)

Syst. Nat., Edn. 10, 611, 1758.

This is the common "crab-louse" occurring on the coarser hairs and especially in the pubic region.

New Haven, Feb., 1894, Nov., 1902 (H. A. Doty). Storrs (G. H. L.).

Pedicinus Gervais.

The species of this genus are easily recognized by the three-jointed antennae. They have elongate bodies and occur on monkeys. While not native to this region there is of course frequent opportunity for their appearance in connection with their hosts.

Family HAEMATOPINIDAE.

The species of this family occur on a variety of mammals living on land but not on man or other primates. The eyes are very small or wanting and the feet are often provided with special structure for clasping the hairs. Most of the species are distinctly flattened.

Key to Genera.

1. Antennae five segmented 2
- Antennae three segmented 13
2. All legs of equal size *Haematopinus*, p. 20
- Front legs smaller than the others 3
3. Front legs with two claws [*Scipio*]
- Front legs with one claw only 4
4. Abdomen without pleural plates 5
- Abdomen with pleural plates 6
5. Abdominal spiracles large tubular, projecting [*Solenoptes*]
- Abdominal spiracles small not projecting 7
6. Tergum and sternum with more than one series of hairs 8
- Tergum and sternum with but one series of hairs 9
7. Head usually slender *Linognathus*, p. 20
- Head usually broad *Haemodipsus*, p. 22
8. Tergum and sternum with not more than two series of hairs 10
- Tergum and sternum with three series of hairs .. *Hoplopleura*, p. 21
9. Middle and hind legs of equal size, larger than front pair 12
- Front and middle legs of equal size smaller than hind *Enderleinellus*, p. 22
10. First antennal joint with a stout spine *Neohaematopinus*, p. 22
- First antennal joint without spine 11
11. Abdominal tergum with chitinized plates *Polyplax*, p. 21
- Abdominal tergum without chitinized plates [*Linognathoides*]

12. Abdomen with a pair of chitinized plates on second sternite
 [Fahrenheit] Abdomen without such plates *Haemodipsus* (in part), p. 22
13. Hind legs with stalked disk-shaped appendages on femur and tibia
 Euhaematopinus, p. 22
 Hind legs without disk-shaped appendages [*Haematopinoides*]

Haematopinus Leach.

These are large species mostly occurring on Ungulates. The antennae are five-segmented, the head broad posteriorly and the legs all of nearly equal size.

H. eurysternus (Nitzsch). Short nosed ox louse. (Pl. i, 6.)

German's Magazine, iii, 305, 1818.

Of medium size, head short, abdomen broad, a broad black stripe on the hinder middle area of the abdomen in the male. Length 3.5-5 mm. Common throughout the country and recorded for Connecticut.

Somers, 29 Nov., 1911. (Theop. Legere): Storrs (G. H. L.).

H. suis (Linnaeus). Hog louse. (Pl. i, 7.)

Syst. Nat., Edn. 10, 611, 1758.

Large, head long, abdomen broad. Length 6-7 mm. The common hog louse, very common on this animal but not known from other hosts. Undoubtedly common in Connecticut.

Storrs, 1921 (G. H. Lamson).

H. asini (Linnaeus) *macrocephalus* Burmeister. Horse louse.

Syst. Nat., Edn., 10, 612, 1758.

Head elongate, narrowed anteriorly, abdomen broad. Length about 4 mm. This is the sucking louse of horse and ass, and while not commonly as abundant as the lice of cattle and hogs, it must certainly occur on horses generally and will no doubt be found in Connecticut.

Linognathus Enderlein.

Head small without sharp projecting angles, the antennae with five segments and the abdomen without chitinized plates.

L. vituli (Linnaeus). Long-nosed ox louse. (Pl. i, 4 and 5.)

Syst. Nat., Edn. 10, 611, 1758.

This is a slender long-headed species about 3 mm. long which occurs on cattle. There are few records for Connecticut but the species is probably fairly common.

Storrs (G. H. L.).

L. pedalis (Osborn).

Bull. 5, N. S., Div. Ent., U. S. Dept. Agr., 170, 1896.

Head very short, abdomen broad, fusiform. Length 2.20 mm. This species has been found only rarely but it is pretty certain to be secured from sheep where it affects the hair of the lower part of the legs.

L. piliferus (Burmeister). Dog louse.

Gen. Rhyncota, No. 13, 1838.

This louse, though not very commonly collected, is likely to be found by examination of dogs in any locality.

Fairfield, 9 May, 1916 (Mrs. J. O. Wright).

L. stenopsis (Burmeister).

Gen. Rhyncota, No. 3, 1838.

This rather slender species occurs on the goat, and while not recorded for Connecticut, it is pretty certain to be found if sought for on its normal host.

Polyplax Enderlein.

Eyes lacking, antennae five-jointed, front legs small, pleural plates well developed. Occurs on mice, rats, and other Muridae.

P. spinulosa (Burmeister).

Gen. Rhyncota, No. 8, 1839.

Elongate, head small, eyes wanting. Occurs on the common rat. Is widely distributed.

Connecticut.

Hoplopleura Enderlein.

Head short, antennae five-jointed, front legs small, three series of hairs.

H. acanthopus (Burmeister) var. **americanus** Kellogg and Ferris.

Anoplura and Mallophaga of North American Mammals, 16, 1915.

This has been separated from the European form on the basis of slight variation in the sternal plate. It has a more or less pronounced rounded projection on the lateral margin which is absent in *acanthopus*. Occurs on the field mouse *Arvicola*, and will quite certainly be found on this animal in Connecticut.

H. hesperomydis (Osborn).

Bull. 7, O. S., Div. Ent., U. S. Dept. Agr., 26, 1891.

Differs from *acanthopus* in smaller sternal plate which is angular and pointed behind. Specimens in the eastern United States have been taken from the white-footed mouse *Peromyscus leucopus* at Ames, Iowa, and will doubtless be found commonly in New England.

H. erratica (Osborn).

Bull. 5, N. S., Div. Ent., U. S. Dept. Agr., 186, 1896.

This species was described from specimens collected by Dr. Burnett and is presumably from the chipmunk as the normal host, although specimens were labeled as from a gull, which must certainly have been due to accidental straggling as stated at time of description.

Haemodipsus Enderlein.

Head short, widened behind, with antennae near the front.

H. ventricosus (Denny).

Mon. Anopl. Brit., 30, 1842.

Short and thick with the abdomen rounded. Occurs on the rabbit, apparently the same species being found on the common wood rabbit *Lepus sylvaticus*, the domestic hare, and the other species of the genus *Lepus*.

Neohaematopinus Mjoberg.

The antennae are five-jointed, very close to the front of the head and the basal segment has a stout spine or has the outer hind angle produced.

N. sciuropteri (Osborn).

Bull. 7, O. S., Div. Ent., U. S. Dept. Agr., 23, 1891.

This species was described from the flying squirrel and is not known from any other host.

N. antennatus (Osborn).

Bull. 7, O. S., Div. Ent., U. S. Dept. Agr., 25, 1891.

This species is easily recognized by the strong backwardly directed spine on the first antennal segment. It occurs on the squirrels of the genus *Sciurus*, and while not recorded from New England is almost certain to be found on the proper hosts.

Enderleinellus Fahrenholz.

Antennae five-segmented, fore and middle legs of equal size.

E. suturalis (Osborn).

Bull. 7, O. S., Div. Ent., U. S. Dept. Agr., 27, 1891.

This species, recognized by the prominent suture across the head just behind the antennae, occurs on the ground squirrels of the genus *Citellus*.

Euhaematopinus Osborn.

Antennae three-segmented,* the hind legs with broad disk like appendage on femur and tibia.

E. abnormis (Osborn).

Bull. 5, N. S., Div. Ent., U. S. Dept. Agr., 187, 1896.

The three-jointed* antennae and the peculiar processes on the femur and tibia of the hind legs distinguish this species readily. Moreover, it is known only from the mole *Scalops aquaticus* or its variety *argentatus*.

* Four, one microscopic, according to Ferris.

Family ECHINOPHTHIRIDAE.

Occurs on marine mammals only and the species that may be considered as possibly coming within the range of this list occurs on the seals.

Antarctophthirus Enderlein.

Antennae five-segmented, abdomen beset with fine scales.

A. trichechi (Boheman).

Vetensk. Akad. Forhandl., 12, 577, 1865.

Recorded from the walrus and of doubtful occurrence within our territory except on animals under confinement.

Echinophthirus Enderlein.

Antennae four-segmented, body without scales.

E. phocae (Lucas).

Mag. Zool., Ins., 121, 1842.

This species has been reported from seals in the New York Aquarium and may occur on straggling seals along the New England coast. Its normal host is the common harbor seal *Phoca*.

Suborder Homoptera.

Key to Families.

1. Proboscis attached back of the head apparently between the fore legs 2
 Proboscis plainly attached to the head 5
2. Tarsi two-jointed with two apical claws, wings when present four in number. Species capable of active movement 3
 Tarsi one-jointed with one apical claw. Males usually with one pair of wings. Females wingless, often without legs and immovably fixed to host plant COCCIDAE, p. 346
3. Hind femora not enlarged. Fore wings similar in texture to rear wings 4
 Hind femora enlarged for jumping. Fore wings thickened PSYLLIDAE, p. 243
4. Legs short, tarsal joints nearly equal in size. Wings usually opaque, whitish, or marked with spots or bands; pupa stage present ALEYRODIDAE, p. 335
 Legs long and slender, basal joint of tarsi often short; wings transparent, occasionally more or less colored. APHIDIDAE, p. 250
 and CHERMESIDAE, p. 329
5. Ocelli two, rarely more; front femora not enlarged; species less than 25 mm. in length 6
 Ocelli three; front femora thickened and usually spined beneath. Comparatively large species over 25 mm. in length. CICADIDAE, p. 238
6. Antennae inserted in front of and between the eyes. Ocelli between the eyes, on the vertex or on the front 7
 Antennae inserted below the eyes, ocelli usually in cavities beneath or between the eyes FULGORIDAE, p. 24

7. Pronotum not extending back over the abdomen; not elevated .. 8
 Pronotum extending back over the abdomen, usually much
 elevatedMEMBRACIDAE, p. 163
 8. Tibiae with but few spines, not in two rows ...CERCOPIDAE, p. 206
 Tibiae with a double row of spines beneath..CICADELLIDAE, p. 56

Family FULGORIDAE.

By EDWARD PAYSON VAN DUZEE.

In its general facies this family is widely distinct from those that precede it. The head is usually large, sometimes produced anteriorly into more or less of a rostrum; the vertex, front and often the clypeus is furnished with three carinae; the pronotum is commonly narrow and often strongly angled, forming a mere collar to the front of the mesonotum, and is usually tricarinate, the lateral carinae frequently curving around behind the eyes. The

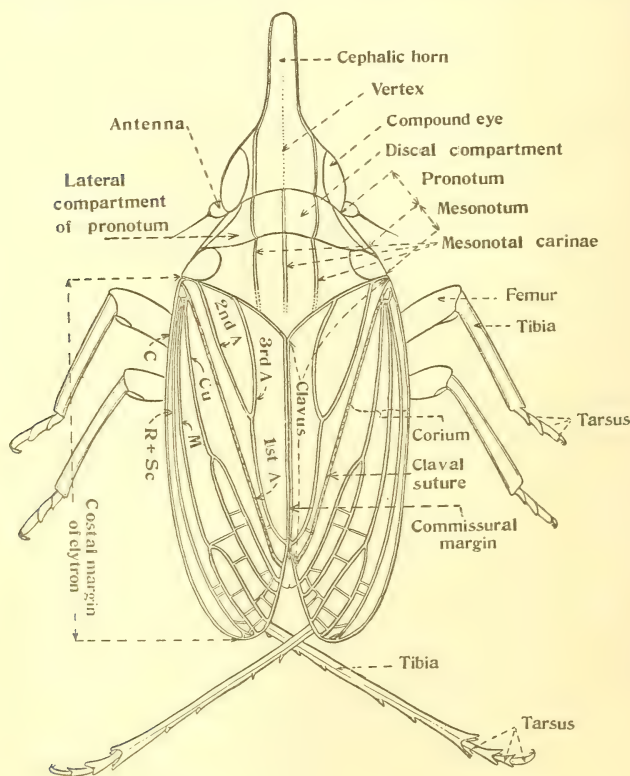


FIG. 1. *Scolops angustatus* Uhler,—dorsal view, showing parts used in classification. Greatly enlarged. Drawing by Dr. Philip Garman.

mesonotum is large, usually convex, tricarinate, with the suture separating its posterior sclerite, or scutellum from the anterior, more or less distinct. The elytra vary from membranous to coriaceous or nearly so; ordinarily they are folded roof-like when at rest but may be either vertical or nearly horizontal; they may be narrowed to a strap-like piece or very broad and rounded, and in venation they vary from the simplest form to the most complex; they are often short and the same species may show two or more distinct variations in this particular. The wings may be much aborted or entirely wanting even in forms with fully developed elytra and the same species may be apterous or fully

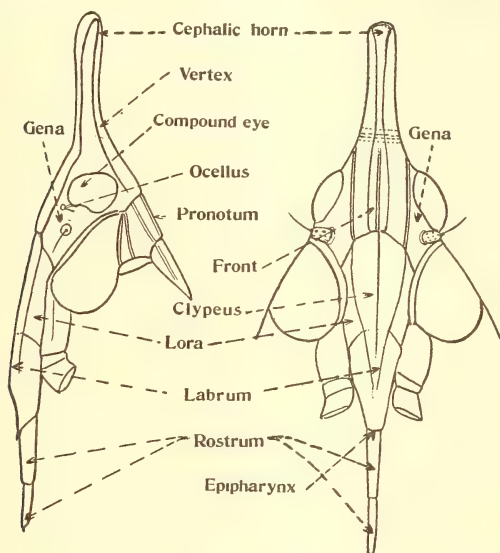


FIG. 2. *Scolops angustatus* Uhler,—lateral and ventral views of head showing structures used in classification. Greatly enlarged. Drawing by Dr. Philip Garman.

winged. The antennae usually have two segments and a terminal seta and these segments may be terete, flattened or greatly expanded, or the second may be split to its base into two or more filaments. The ocelli are ordinarily two, placed close to the eyes, near their lower angle, but there may be a third at the apex of the front. The legs are frequently flattened and the hind tibiae are usually two to five spined, and in one subfamily are furnished with a movable spur at apex.

Various attempts have been made to split this family up into several families; but in spite of form-diversity there is a certain uniformity of character running through the whole group that makes such a division undesirable, at least with our present knowl-

edge. Personally I deprecate the present tendency to raise subfamilies to family rank, for I think them just as useful and much more convenient as subfamilies, and after all, it is merely a matter of terminology.

The Fulgoridae as a whole is a tropical group, but thus far 77 genera and 357 species have been recorded from America north of Mexico.

Key to Subfamilies.

1. Anal area of the wings reticulated, sides of the clypeus carinate
FULGORINAE, p. 26
Anal area of the wings rarely reticulated, clypeus in this case without lateral carinae 2
2. Posterior tibiae armed with a movable spur DELPHACINAE, p. 45
Posterior tibiae without a movable spur 3
3. Clavus granulated; costa dilated, the costal membrane transversely venose FLATINAE, p. 39
Clavus rarely granulated, costa in this case not dilated 4
4. Veins of the clavus not attaining the apex but united with the commissural margin before the apex 5
Veins of the clavus either continued to the apex or united with the claval suture before the apex 6
5. Apex of the front without an ocellus; elytra reticulated toward their apex DICTYOPHORINAE, p. 27
Apex of the front usually with a third ocellus; elytra not reticulated apically CIXIINAE, p. 32
6. Elytra ample, held vertical with the costal margin meeting below the abdomen, closely reticulated over the whole surface, the costal and apical margins without transverse veins; front continued over on to the superior aspect of the head without an apical transverse carina ACANALONHNINAE, p. 38
Elytra when broad held more horizontal, not meeting below nor closely reticulated over the whole surface; the front usually distinguished from the vertex by a transverse carina at the apex of the head 7
7. Head broad, with the eyes nearly or quite as broad as the mesonotum; pronotum without carinae or with median carina only ... 8
Head usually much narrower than the mesonotum; if as wide the pronotum emarginate behind and tricarinate 9
8. Pronotum truncated behind or at most with a shallow rounded sinus ISSINAE, p. 35
Pronotum angularly emarginate behind [RICANIINAE]
9. Elytra distinctly amplified within and overlapping beyond the apex of the clavus ACHILINAE, p. 29
Elytra not amplified within nor overlapping at apex 10
10. Elytral membrane strongly differentiated from the corium with numerous simple longitudinal nervures [TROPIDUCHINAE]
Elytral venation simple, without a distinct closely veined membrane; pronotum very short, deeply angularly emarginate behind
DERBINAE, p. 39

Subfamily FULGORINAE.

So far as I know no representative of this subfamily has been taken north of New Jersey and Ohio.

Subfamily DICTYOPHORINAE.

Key to Genera.

1. Vertex produced and angulate before, frequently forming a long cephalic process 2
Vertex short, transverse; elytra in the short-winged form scarcely exceeding the abdomen, convex; anterior femora foliaceous ... *Phylloscelis*, p. 28
2. Head moderately produced, depressed and carinate above; cephalic process when present not exceeding the base of the frontal compartments *Dictyophora*, p. 27
Head greatly produced in a cephalic process which is extended much beyond the base of the frontal compartments, its superior surface sulcate but not carinate *Scolops*, p. 27

Dictyophora Germar.

These are elongated, frail looking insects with nearly hyaline elytra and more or less produced head. They are found in damp situations in the warmer parts of the country.

Key to Species.

- Vertex fully twice as long as its basal width; median carina extending a little more than half way to the apex, the three frontal carinae almost parallel throughout their length *microrrhina*
- Vertex scarcely longer than its width at base, its median carina almost attaining the apex; frontal carinae diverging basally (toward the apex of the head), forming a spatulate compartment, concolorous at their extreme base where they meet in an acute angle *lingula*

D. microrrhina Walker.

List. Homop. ii, 315, 1851.

A southern form which has been taken as far north as the vicinity of New York City and may be taken in southern Connecticut.

D. lingula Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 470, 1908.

This species has about the same distribution as the preceding and should be taken in Connecticut. The closely allied *florens* Stål has black carinae at the apex of the head. It has not been reported from north of Georgia.

Scolops Schaum.

A genus of rather small brown or gray leaping insects inhabiting meadows and weedy spots. Their long cephalic process and habit of standing well up on their hind legs gives them somewhat a bird-like aspect.

Key to Species.

1. Elytra with supernumerary cross-veins forming many small areoles beyond the middle; nervures slender *sulcipes*
Elytra without supernumerary cross-veins toward their apex; nervures strong 2

2. Radial (outer) nervure forked some distance beyond the cubital (inner); cephalic horn short, not longer than distance from front of eye to hind margin of pronotum **angustatus**
Radial and cubital nervures forked on about the same line; cephalic horn about one-half longer than the distance from front of eye to hind margin of pronotum 3
3. Rostrum reaching the posterior coxae **spurcus**
Rostrum reaching nearly to apex of the venter **perdix**

S. sulcipes Say. (Pl. iv, 1.)

Jour. Acad. Nat. Sci. Phila., iv, 335, 1825.

A large brown species easily recognized by the numerous small areoles in the apical half of the elytra. It is the most abundant and widely distributed species of the genus.

Branford, 29 July, 1904 (P. L. B.); New Haven, 29 July, 1920 (M. P. Z.); 31 July, 1920 (B. H. W.); Cornwall, 23 Aug., 1920 (K. F. C.); Bridgeport, 20 Sept., 1920 (B. H. W.).

S. spurcus Uhler.

Trans. Md. Acad. Sci., i, 403, 1900.

This mottled gray and brown insect has been taken from New Jersey southward and should occur in Connecticut.

S. perdix Uhler.

Trans. Md. Acad. Sci., i, 405, 1900.

Similar to the preceding but with a longer rostrum. It is distributed from Massachusetts southward and must occur in Connecticut.

S. angustatus Uhler. (Figs. 1 and 2.)

Bull. U. S. Geol. Surv., i, 350, 1876.

A small pale form easily recognized by its short slender cephalic process.

New Haven, 19 July, 16 Aug., 1904 (P. L. B.); 16 Aug., 1904, 19 July, 1905, 17 July, 1908, 17 June, 1908 (B. H. W.); 23 Aug., 1906 (W. E. B.); 31 July, 5 Aug., 1920 (B. H. W.); Yalesville, 20 Aug., 1920 (M. P. Z.); North Haven, 4 Sept., 1921 (B. H. W.).

Phylloscelis Germar.

The brachypterous form of these insects, which is much the most common, is of an ovate or subhemispherical form and may be readily recognized by the broad leaf-like anterior femora.

Key to Species.

1. Elytra brown, the nervures fuscous dotted with pale **pallescentis**
Elytra black, the nervures concolorous or pale and undotted 2
2. Nervures concolorous, black **atra**
Nervures pale var. **albovenosa**

P. atra Germar. (Pl. iv, 5.)

Zeit. f. Ent., i, 192, 1839.

The brachypterous form is a nearly globular, shining black insect with the face marked with pale dots and crossed by a pale

band near the apex of the cheeks. In the macropterous form the elytra are short and truncated at apex.

New Haven, 14 Aug., 1906 (W. E. B.), 21 Aug., 1906 (B. H. W.), 20 Aug., 1910 (A. B. C.), 20 Aug., 1910 (B. H. W.).

P. atra var. **albovenosa** Melichar.

Abh. K. K. Zool. Bot. Ges. Wien, iii, pt. 4, 179, 1906.

This variety differs from the type form only in having the elytral nervures pale, rufous, yellowish or almost white. Apparently it always occurs with the typical form.

New Haven, 21 Aug., 1906, 21 Aug., 1909, 28 Aug., 1910 (B. H. W.).

P. pallescens Germar.

Zeit. f. Ent., i, 192, 1839.

This species has the same form as the preceding but has a brown color and dotted nervures. Like that species it is distributed from Massachusetts to Florida and should be found in Connecticut.

Subfamily ACHILINAE.

This subfamily as represented in our fauna may be distinguished from the *Cixiinae*, which they most resemble, by having the claval nervure continued to its apex. They are elongated or oblong depressed insects with their folded elytra overlapping at apex and head often produced. From the *Issinae* they differ in having the head much narrower than the thorax with the pronotum emarginate behind, sometimes deeply so.

Key to Genera.

- | | |
|---|-------------------------|
| Lateral compartments of the pronotum (behind the eyes) at least as long as the eye, sometimes much longer | Epiptera , p. 29 |
| Lateral compartments of the pronotum, when distinguished, shorter than the eye, generally much shorter | Catonia , p. 30 |

Epiptera Metcalf.*

(*Elidiptera* of Authors, not Spinola.)

(*Helicoptera* Amyot and Serville.)

Key to Species.

1. Head rostrate produced, the vertex surpassing the front line of the eyes by at least twice the length of the eye **colorata**
- Head produced little if any more than the length of the eye 2
2. Black with a white band across the face and pleural pieces; elytra minutely dotted with pale **opaca**
- More or less variegated with brown or pale 3
3. Vertex produced before the eyes for fully the length of the eye; front brown on base, whitish on apical one-half **pallida**
- Vertex produced before the eye for about the width of the eye; front brown irrorate with pale, scarcely darker at base **variegata**

* Since this paper was set in type, Z. P. Metcalf has described the following new species from Connecticut, in Journal of the Elisha Mitchell Scientific Society, Vol. 39: *Epiptera brittoni*, *Liburnia waldeni*, *Megamelus distinctus*, *Criomorphus conspicuus*, *Herpis incisa* and *Cixius apicalis* (W. E. B.).

E. colorata Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 476, 1908.

More slender than most of our species; black, vertex and front white, abdomen red; elytra minutely dotted and veined with pale. Described from about Buffalo, N. Y. and reported from near the Hudson River so it will probably be found in western Connecticut.

E. opaca (Say).

Jour. Acad. Nat. Sci. Phila., vi, 239, 1830.

A large blackish species with a broad clear-cut whitish vitta across the face and pectoral pieces. It has been reported from New Hampshire to South Carolina and should occur in Connecticut.

E. pallida (Say).

Jour. Acad. Nat. Sci. Phila., vi, 240, 1830.

Has the same distribution as the preceding and must occur in Connecticut.

E. variegata Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 479, 1908.

Found throughout the eastern states and Canada.

Rainbow, 30 Sept., 1908 (W. E. B.).

Catonia Uhler.

Shorter and more slender insects with shorter and more deeply emarginate pronotum than we find in *Elidiptera*.

Key to Species.

- | | |
|---|--------------------|
| 1. Face distinctly transversely banded | 2 |
| Face without transverse bands | 6 |
| 2. Front black; clypeus white; elytra testaceous, almost immaculate | <i>dimidiata</i> |
| Front banded with black and white | 3 |
| 3. Front whitish on basal one-half, fuscous on apical half; disk of mesonotum with a fuscous cloud | <i>nava</i> |
| Front blackish with a transverse white median band | 4 |
| 4. Elytra almost uniformly testaceous | <i>impunctata</i> |
| Elytra varied with whitish and brown or fuscous | 5 |
| 5. Discal compartment of mesonotum fuscous with four pale dots; elytra fuscous varied with whitish | <i>cinctifrons</i> |
| Mesonotum castaneous; elytra varied with ferruginous and pale | <i>picta</i> |
| 6. Median compartments of the mesonotum marked with an ocellate spot at apex; elytra whitish testaceous varied with fuscous and marked with white transverse veinlets | <i>grisea</i> |
| Median compartments of the mesonotum without eye-spots; elytra whitish testaceous obscurely varied with white veinlets | <i>pumila</i> |

C. dimidiata Van Duzee.

Trans. Am. Ent. Soc., xxxvi, 85, 1910.

Easily distinguished from all other described species by having the front entirely black with the clypeus abruptly white. The head

and pronotum are more or less fulvous and the elytra uniformly testaceous-brown. It has been reported from New York and Rhode Island.

Danbury, 29 Aug., 1920 (B. H. W.).

C. impunctata (Fitch).

Homop. N. Y. St. Cab., 46, 1851.

This species and *cinctifrons* have the front black with a broad white transverse band opposite the antennae and the clypeus white; here, however, the mesonotum is fulvous and the elytra testaceous-brown with paler nervures. It has been reported from Rhode Island to Iowa.

East River, 5 Aug., 1908 (C. R. E.); Ellington, 25 Sept., 1920 (B. H. W.).

C. cinctifrons (Fitch).

Trans. N. Y. St. Agr. Soc., xvi, 451, 1856.

A much smaller species than the preceding with the mesonotum and elytra varied with fuscous-brown. It occurs from New York to Maryland.

New Haven, 22 Aug., 1920, Plainfield, 2 Sept., 1920, East Hartford, 14 Sept., 1920 (B. H. W.).

C. picta Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 481, 1908.

A little larger and more ferruginous than *cinctifrons* with the elytra more obscurely varied. The front is normally white and black-banded like the foregoing but often the black is replaced by castaneous. It has been found from New Jersey to Florida.

Guilford, 24 July, 1921 (B. H. W.).

C. nava (Say).

Jour. Acad. Nat. Sci. Phila., vi, 238, 1830.

This is a larger variegated species with the front more narrowed basally where it is gray and more or less mottled. It has been reported from Ontario to Maryland and Iowa and must occur in Connecticut.

C. grisea Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 482, 1908.

This is a gray, slightly mottled insect with numerous white veinlets on the elytra, a pair of small ocellate spots on the mesonotum and a pale, nearly unicolorous front which becomes a little darker at base. It has about the same distribution as *nava*.

Portland, 8 Aug., 1913 (B. H. W.).

C. pumila Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 483, 1908.

A small pale fulvous-brown species having a pallid front and obscurely variegated elytra without white veinlets; the mesonotum also wants the ocellate spots. It has been taken in Ohio and on Long Island and must occur in Connecticut.

Subfamily CIXIINAE.

Oblong depressed insects usually with rather broad elytra which are frequently more or less mottled with fuscous and dotted along the veins. The females have a cottony substance either side of the oviduct.

Key to Genera.

- | | |
|---|------------------------|
| 1. Hind tibiae armed with two or three spines | 2 |
| Hind tibiae unarmed | 3 |
| 2. Base of the vertex angulate-emarginate; mesonotum normally five-carinate | Oliarus , p. 32 |
| Base of the vertex broadly arcuate; mesonotum tricarinate | Cixius , p. 33 |
| 3. Vertex very narrow, its sides parallel or slightly divergent anteriorly; front and clypeus elongated | Oecleus , p. 34 |
| Vertex broader, narrowed anteriorly; front and clypeus together elliptical | Myndus , p. 34 |

Oliarus Stål.

This genus has the vertex quite broad, about as wide as the eyes, with its base angulately emarginate, and the mesonotum in our species furnished with five carinae. It is distributed over nearly all parts of the world and is rich in species.

Key to Species.

- | | |
|---|------------------------|
| 1. Elytra pellucid or nearly so, sometimes varied with brown | 2 |
| Elytra smoky-fuscous, at least at apex | 3 |
| 2. Larger, 6-7 mm.; elytra more or less maculated; the veins white, dotted with brown at their apex | quinquelineatus |
| Smaller, 4-5 mm.; elytra immaculate, their veins heavy and fuscous on apical third | fransciscanus |
| 3. Smaller, 4-6 mm.; elytra clouded on apical third only | humilis |
| Larger, 6-7 mm.; elytra entirely fuscous, the stigma and costal nervure whitish | cinnamomeus |

O. quinquelineatus (Say).

Jour. Acad. Nat. Sci. Phila., vi, 241, 1830.

This large maculated species is common throughout the eastern states and Canada, and extends its range westward to Colorado, but it does not seem to have been reported from Connecticut, where, however, it must occur.

O. fransciscanus (Stål). *complectus* Ball.

Freg. Eugen. Resa., Ins., 273, 1859; Can. Ent., xxxiv, 152, 1902.

This small black species with whitish-hyaline elytra is found from Maine to California.

Scotland, 27 July, 1904 (B. H. W.); New Haven, 26 June, 23 July, 1910, 9 July, 1911, 11 July, 1920, 18 June, 1921 (B. H. W.).

O. humilis (Say). (Pl. iv, 2.)

Jour. Acad. Nat. Sci. Phila., vi, 241, 1830.

This has much the aspect of the preceding except that it is a little broader and has the apical one-third of the elytra infuscated.

It occurs in old pastures and meadows from Ontario to Maryland and Ohio.

Stratford, 1 July, 1908 (B. H. W.) (W. E. B.); 9 July, 1920 (B. H. W.).

O. cinnamomeus Provancher.

Pet. Faune Ent. Can., iii, 223, 1889.

Easily recognized by its larger size and uniformly bluish color with a slender pale costa. I have taken it only on bogs where huckleberries grow.

Colebrook, 20 July, 1905 (W. E. B.).

Cixius Latreille.

The insects of this genus have much the aspect of *Oliarus* but may be distinguished by their having the hind margin of the vertex truncated or but feebly arcuated, not at all angularly emarginate. The mesonotum seems always to be tricarinate.

Key to Species.

1. Front and clypeus black with pale carinae, the clypeus obviously as long as the front; vertex nearly as long as broad **miscellus**
Front black with pale carinae, the clypeus nearly always paler and obviously shorter than the front; vertex transverse, considerably broader than long 2
2. Elytra tinged with fulvous or testaceous, unspotted except for the fuscous stigma; nervures dotted; outer fork of the first sector and the inner sector forked about in line with the fork of the claval vein **pini**
Elytra whitish-hyaline, more or less maculated; outer branch of the first sector forked much nearer the base than the fork of the inner sector 3
3. Larger, 7 mm.; plates of male transverse, less than one-half the length of the pygofer; base of the elytra usually fuscous in the female **basalis**
Smaller, 6 mm.; plates of the male rounded, almost attaining the apex of the pygofer; base of the elytra of the female without a fuscous band **coloepium**

C. basalis Van Duzee.

Proc. Acad. Nat. Sci. Phila., lix, 489, 1908.

This, our largest *Cixius*, resembles in size and marking *Oliarus quinquelineatus*. In the female and sometimes in the male the base of the elytra is infuscated to or beyond the apex of the scutellum. In this species the anal tube of the male is produced far beyond the plates and sides of the genital segment. It is distributed throughout the United States and Canada.

Portland, 8 Aug., 1913, 24 July, 1921 (B. H. W.); Litchfield, 22 July, 1920 (P. G.); East Haven, 21 July, New Haven, 17 July, Hamden, 20 July, 1920, Milford, 13 June, 1921, Cornwall, 18 July, 1921 (B. H. W.).

C. miscellus Van Duzee. *stigmatus* Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., i, 352, 1876.

This species may be distinguished from the next by the longer and more nearly square vertex and longer and narrower front and clypeus which are black with pale carinae.

Dr. Ball has kindly called my attention to the fact that my *Cixius lepidus* is the true *stigmatus* of Say, which is distributed from the Mississippi Valley west to the Rocky Mountains. I have therefore in my Check List renamed this species which has been sufficiently characterized by me in the Canadian Entomologist, Vol. xxxviii, page 408, 1906, and Proceedings Academy of Natural Science of Philadelphia, Vol. lix, pages 488 and 490, 1907. So far as I now know its range is confined to the northern states and Canada.

Stonington, 7 July, 1914 (I. W. D.); Middlebury, 20 June, 1916; Hamden, 12 June, 1919 (M. P. Z.).

C. coloeptium Fitch.

Trans. N. Y. Agr. Soc., xvi, 452, 1856.

Differs from *miscellus* in having the vertex short and distinctly transverse, and the front and clypeus proportionately shorter and broader. Here, however, the elytra are whitish-hyaline and more or less maculated. This species occurs from Ontario and New York west to Colorado.

Scotland, 27 July, 1904, Hamden, 20 June, 1920, New Haven, 17 June, 1920 (B. H. W.).

C. pini Fitch.

Homop. N. Y. St. Cab., 45, 1851.

Size and form of *coloeptium* but readily distinguished by the elytra having a faint fulvous tinge and wanting the spots usually present in the allied species. This form lives on huckleberry bushes in the northern states and Canada.

Goshen, 4 July, 1919 (M. P. Z.); Cornwall, 18 July, 1921 (B. H. W.).

Oecleus Stål.

Stål established this genus for a group of the smaller *Cixiids* having a more slender form and a linear deeply sulcate vertex which is nearly or quite closed posteriorly. One species occurs in Connecticut.

O. borealis Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 495, 1912.

Black or nearly so with the carinae pale and the mesonotum lineate with fulvous and furnished with five carinae; elytra hyaline, the nervures fulvous and minutely dotted with fuscous.

New Haven, 18 June, 1902 (E. J. S. M.); 5 July, 1920 (B. H. W.).

Myndus Stål.

Differs from *Oecleus* in having the vertex as broad as or broader than the eyes and distinctly wider at base. Here the mesonotum is tricarinate.

Key to Species.

1. Uniformly fulvous-yellow with the elytra whitish-hyaline **fulvus**
Front banded with black; various dark markings 2
2. Elytra with a longitudinal fuscous vitta at apex **pictifrons**
Elytra without a fuscous vitta **sordidipennis**

M. pictifrons Stål.

Berl. Ent. Zeit., vi, 307, 1862.

Front broad marked with a conspicuous black band at base and another at apex; color a dull fulvo-testaceous, the outer angles of the mesonotum marked with a fuscous vitta; elytra hyaline, the nervures heavy and distinctly dotted; a sinuous fuscous vitta from the base of the inner anteapical areole to the inner apical angle of the elytra. Length 5 mm. This species has been reported from New York to the District of Columbia and must occur in Connecticut.

M. sordidipennis Stål.

Berl. Ent. Zeit., vi, 308, 1862.

Differs from the preceding in being more strongly tinged with fulvous, in having a wider vertex, and in having no apical fuscous vitta on the elytra and the nervures more slender. It lives throughout the eastern United States and Canada.

New Haven, 4-9 July, 1921 (B. H. W.).

M. fulvus Osborn.

Ohio Nat., iv, 46, 1903.

A small pale fulvous species with immaculate front and whitish hyaline wings. It is known to inhabit from Massachusetts to Ohio.

Rowayton, 9 Aug., 1908 (C. W. J.); New Haven, 23 July, 1910, 9 July, 1911, 11 July, 1920 (B. H. W.).

Subfamily ISSINAE.

Thick-set insects usually with broad heads, more or less truncated before but occasionally produced a little. The elytra when fully developed are often convex and more or less gibbous near their base.

Key to Tribes.

- Head rostrate-produced, or having the clypeus strongly inflexed and shouldered, thus forming nearly a right angle with the line of the front *Caliscelini*
- Head not rostrate-produced, the clypeus on nearly the same plane as the front *Issini*

Tribe **CALISCELINI.**

In this tribe the elytra are usually short, rarely surpassing the middle of the abdomen; long-winged individuals may, however, be found in any of the species.

Key to Genera.

1. Front vertical or inferior, not visible from above, the head not at all produced **Aphelonema**, p. 37
- Front more or less superior, visible from above, the head more or less rostrate-produced 2
2. Anterior tibiae moderately foliaceous along its whole upper edge; apex of the produced head forming a nearly spherical polished knob **Fitchiella**, p. 36
- Anterior tibiae simple; apex of the produced head sometimes knob-like, in that case with a sharp median carina; macrop-
terous elytra with a series of heavy transverse veins before the
apical areoles **Bruchomorpha**, p. 36

Fitchiella Van Duzee.*Naso* Fitch.**F. robertsoni** (Fitch).

Trans. N. Y. St. Agr. Soc., xvi, 396, 1856.

Testaceous, veined and dotted with black; the knob-like apex of the head, two vittae on either side of the apex of the front, another pair on the vertex and one on the mesonotum, black; beneath and legs black, varied with pale. Length 2-3 mm. New York to Florida and must be taken in Connecticut.

Bruchomorpha Newman.*Key to Species.*

1. Head produced in a rounded, compressed and carinate, knob-like rostrum 2
- Head rounded at apex, not produced in a rostrum; color black, more or less metallic, the coxae only pale, the median carina of the front scarcely paler **tristis**
2. Black, with a conspicuous, percurrent, dorsal vitta and the legs and coxal region almost white **dorsata**
- Black, narrow median vitta on the front and vertex, legs and coxal region pale or castaneous **oculata**

B. dorsata Fitch.

Trans. N. Y. St. Agr. Soc., xvi, 396, 1856.

This species has distinct coppery reflections and may be distinguished from the more western *suturalis* by having the dorsal vitta continued to the apex of the abdomen. It has been reported from New York westward and should be found in Connecticut.

B. oculata Newman.

Ent. Mag., v, 399, 1838.

Color of the preceding but with the dorsal vitta narrow and confined to the head. Common in grassy places throughout the eastern United States and Canada.

Colebrook, 21 July, 1905 (H. L. V.); Cromwell, 18 July, 1921 (B. H. W.); Portland, 24 July, 1921 (M. P. Z.) (B. H. W.).

B. tristis Stål.

Berl. Ent. Zeit., vi, 309, 1862.

More bluish or greenish black, with the dorsal carina of the head scarcely paler. It has the same distribution as the preceding and should be found in Connecticut.

Brookfield, 27 July, E. L. Dickerson.

Aphelonema Uhler.

Short thick-set little insects with a square head and nearly vertical front, marked on the sides of the head, thorax and abdomen with pitted granules; the front oval and truncated at base.

Key to Species.

- Whitish, lineate with black; front ovate**histrionica**
Testaceous, nearly immaculate; front nearly circular**simplex**

A. histrionica (Stål).

Berl. Ent. Zeit., vi, 310, 1862.

Readily distinguished by two parallel dorsal lines and broader lateral vittae on the abdomen; the sides of the face, pro- and mesonotum are black with the carinae and granules pale. Massachusetts westward and doubtless in Connecticut.

A. simplex Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., i, 356, 1876.

Nearly uniformly soiled- or yellowish-testaceous. Recorded from New Jersey westward.

Plainville, 2 Sept., 1921 (B. H. W.).

Tribe **ISSINI**.

But one genus of this tribe has a distribution that would be likely to bring it into Connecticut.

Thionia Stål.

Stout oblong insects with wings well developed; elytra oblong with strong veins, the front hardly longer than wide, sometimes with three distinct discal carinae.

Key to Species.

1. Pale greenish-testaceous; elytra parallel, semivitreous, the longitudinal veins strong and fuscous, the transverse very faint; front with but one discal carina**simplex**
More infuscated and maculated; elytra broad with distinct cross-veins 2
2. Elytra brown, dotted with round fuscous points, the veins fuscous; face with a pale band crossing the base of the clypeus**elliptica**
Elytra more thickened and distinctly maculated, the marks usually forming a transverse band before the middle; disk of the front distinctly tricarinate**bullata**

T. simplex (Germar).

Thon's Ent. Archiv., ii, 51, 1830.

Distinct by its narrow form, greenish-testaceous color with darker venation, and the transverse black line on the apex of the head. New Jersey southward and westward. May occur in Connecticut.

T. elliptica (Germar).

Thon's Ent. Archiv., ii, 51, 1830.

Larger, broader and darker brown than *simplex* with the elytra closely dotted with brown and a transverse pale band on the face. Occurs from New Jersey southward and might occur in southern Connecticut.

T. bullata (Say).

Jour. Acad. Nat. Sci. Phila., vi, 240, 1830.

A more maculated species with three distinct discal carinae on the front. It is distributed from Ontario southward and westward and must occur in Connecticut.

Subfamily ACANALONIINAE.

Distinguished by having the broad vertical elytra closely reticulated all over, without a series of marginal parallel veins. But one genus occurs in our fauna. All are pretty, green insects.

Acanalonia Spinola.*Amphiscepa* Uhler.*Key to Species.*

Dorsum concolorous; vertex subconically produced **conica**
 Dorsum marked with a double fuscous vitta, vertex short, truncate
bivittata

A. bivittata (Say). (Pl. iv, 3.)

Jour. Acad. Nat. Sci. Phila., iv, 335, 1825.

Clear green marked with two approximate dark brown dorsal vittae which converge to the tip of the clavus. United States and Canada east of the Rocky Mountains.

New Haven, 1 Aug., 1904 (P. L. B.), 16 Aug., 12 Sept., 1904 (B. H. W.), 27 Aug., 1914 (I. W. D.), 18 Aug., 1904 (W. E. B.); New Canaan, 1 Oct., 1903 (B. H. W.), 2 Oct., 1907 (W. E. B.), 5 Sept., 1914 (M. P. Z.); East Hartford, 9 Aug., 1904 (P. L. B.); Scotland, 8 Aug., 1905 (B. H. W.); Prospect, 15 Aug., 1906 (W. E. B.); East River, 29 Aug., 1908 (C. R. E.); Middletown, 23 Aug., 1912 (D. J. C.); Yalesville, 24 Sept., 1912 (H. B. K.).

A. conica (Say).

Jour. Acad. Nat. Sci. Phila., vi, 238, 1830.

A larger, uniformly pale green species well distinguished by having the vertex conically produced but flattened above. Recorded from Ohio to Virginia and Texas and may occur in southern Connecticut.

Subfamily FLATINAE.

Here the clavus is granulated at base and the costal area of the elytra has a series of transverse veins.

Ormenis Stål.

Differs from the preceding genus in having a granulated clavus and the apex of the elytra furnished with one or two series of regular parallel areoles.

Key to Species.

Color a uniform clear green *septentrionalis*
 Color fuscous with the costa and claval suture pale *pruinosa*

O. pruinosa (Say). (Pl. iv, 4.)

Jour. Acad. Nat. Sci. Phila., vi, 237, 1830.

A dark fuscous-brown species marked with pale along the costa and suture and generally with about three dark points near the base of the elytra. When mature the whole insect is usually heavily white-pruinose. It occurs throughout the eastern United States and Canada.

New Haven, 14 July, 1899 (V. L. Churchill), 1 Aug., 1905 (B. H. W.), 21 Aug., 1904, 7 Aug., 1905, 9 Sept., 1907 (W. E. B.), 26 Aug., 1913 (Q. S. L.), 24 Aug., 1914 (M. P. Z.); New Canaan, 14 Sept., 1906 (W. E. B.); Hartford, 10 Sept., 1907 (G. H. H.), 12 Sept., 1907 (W. E. B.); East River, 6 Aug., 1908 (C. R. E.); Wallingford, 26 July, 1911 (J. K. L.); Brookfield (E. L. D.).

O. septentrionalis (Spinola). (Pl. iv, 6.)

Ann. Soc. Ent. Fr., viii, 436, 1839.

A nearly immaculate clear light green insect, often white-pruinose. It is distributed from New York south and west nearly to the Rocky Mountains.

New Haven, 29 Sept., 3 Oct., 1902 (B. H. W.), 24 Aug., 1904 (P. L. B.), 14 Aug., 1906 (W. E. B.), 28 Aug., 1913 (Q. S. L.), 13 Aug., 1914 (M. P. Z.), 27 Aug., 1914 (I. W. D.); New Canaan, 9 Oct., Stafford, 24 Aug., 1905, Westville, 5, 9 Sept., 1907, Hartford, 10 Sept., 1907, Stratford, 13 Sept., 1907 (W. E. B.); East River, 6 Aug., 1908 (C. R. E.); Portland, 15 Aug., 1913 (B. H. W.).

Subfamily DERBINAE.

Frail moth-like Fulgorids with the elytra and wings ample and often much elongated; head more or less compressed with the front often reduced to a mere sulcus; antennae often flattened, and, in *Otiocerus*, split into two or three filaments, inserted in cup-like cavities. They may be found on willows and other trees in late summer and early autumn.

Key to Genera.

1. Second antennal joint nearly globular, but little flattened, antennal sockets conspicuously expanded, equalling or exceeding the second antennal joint; front moderately broad 2

- Second antennal joint flattened and greatly expanded; antennal sockets small, rim-like; front reduced to a mere sulcus, the lateral carinae contiguous 3
2. Front broader, with a median carina usually indicated, its width at least one-third its length; vertex transverse, sloping into the base of the front *Lamenia*, p. 40
- Front narrow, without a median carina; its width never one-fourth its length; vertex horizontal, narrowed before, angled to the base of the front *Cenchrea*, p. 41
3. Second antennal joint split into two to four filaments *Otiocerus*, p. 43
- Second antennal joint entire 4
4. Second antennal joint hardly more than twice longer than broad *Cyclokara*, p. 41
- Second antennal joint obviously more than twice longer than broad 5
5. Ocelli absent; second antennal joint narrow, subterete, a little wider apically; rostrum short, reaching the base of the hind coxae *Anotia*, p. 42
- Ocelli present; second antennal joint broad, linear, with a sub-apical notch for the seta; rostrum long, reaching the middle of the venter *Amalopota*, p. 41

Lamenia Stål.

Shorter winged forms recalling *Ormenis* in miniature, and often pruinose as in that genus. Their broader and subglobose front will serve to distinguish them from our other Derbidae. I cannot agree with Mr. Muir in restricting *Lamenia* to oriental forms and placing our species in genus *Herpis* Stål.

Key to Species.

1. Color soiled white, maculated all over with fuscous and with a fuscous median line on the head, pro- and mesonotum *maculata*
Insects nearly uniform in color, without maculations 2
2. Color testaceous, becoming more or less fulvous on the head, pro- and mesonotum *edentula*
Color slaty-black, almost immaculate, white pruinose when fresh 3
3. Larger, 4-4.5 mm.; inner margin of the male plates entire or nearly so *vulgaris*
Smaller, 3-3.5 mm.; inner margin of the male plates distinctly notched near their base *obscura*

L. vulgaris (Fitch).

Homop. N. Y. St. Cab., 47, 1851.

A small blackish-fuscous insect, usually covered with a white bloom. Found throughout the eastern United States and Canada, usually on oaks.

East Wallingford, 6 July, 1904, Torrington, 7 July, 1905 (W. E. B.); Branford, 28 July, 1915 (H. L. V.).

L. obscura Ball.

Can. Ent., xxxiv, 262, 1902.

A smaller species than *vulgaris* but otherwise very similar. It has the same distribution but does not seem to inhabit the oak.

New Haven, 26 June, 1910, 4 July, 1920 (B. H. W.); East River, 4 Aug., 1910 (C. R. E.); North Branford, 23 June, 1912 (B. H. W.).

L. edentula Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 503, 1912.

A pale fulvous or testaceous species found from New Jersey southward and might occur in southern Connecticut.

L. maculata Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 503, 1912.

About the size of *vulgaris* but very distinct in its white and fuscous markings. It has been found in southern Ontario and New Jersey and probably will be taken in Connecticut.

Cenchrea Westwood.

Closely allied to *Lamenia* but sufficiently distinct in its well differentiated vertex, narrower front, and generally more elongated form. One species may reach Connecticut.

C. uhleri Ball.

Can. Ent., xxxiv, 261, 1902.

A pale fulvous insect, 5 mm. to tip of the elytra, marked with commissural and subcostal vittae on the slightly smoky elytra. It has been reported from New Jersey southward and westward to Kansas.

Cyclokara Muir.

But one species has been found in our territory.

C. vanduzei (Ball).

Can. Ent., xxxiv, 260, 1902.

This insect has much the aspect of a small *Otiocerus degeeri*, but generically it is sufficiently distinct by its shorter head and broad simple antennae. It has been taken in New York, Pennsylvania and Ohio and will probably be found in Connecticut.

Amalopota Van Duzee.

Very near to *Anotia* but may be separated by the characters given in the table.

Key to Species.

- Elytra whitish-hyaline, marked with a fuscous band at base and another near the apex, the latter veined with sanguinous toward the costa **uhleri**
 Elytra creamy-white, marked with a longitudinal fuscous vitta along the clavus to the stigma where it is branched, one fork reaching the apex near the costa and the other near the internal angle .. **fitchi**

A. uhleri Van Duzee.

Can. Ent., xxi, 178, 1889.

This very pretty little species is found about open woodlands in the northern states and lower Canada and doubtless will be taken in Connecticut.

A. fitchi Van Duzée.

Can. Ent., xxv, 280, 1893.

This species has much the aspect of *Anotia bonnetii* but with a shorter head and broader antennae. It is intermediate in its characters between *Amalopota* and *Anotia*. It has the same distribution as *uhleri* and should be found in Connecticut.

Anotia Fitch.

As stated by Dr. Fitch the insects of this genus are found in swampy places on willows.

Key to Species.

1. Size larger (10 mm.); humeral dilations forming erect tongue-like processes about as long as the width of the elytra at that point; color whitish with a transverse fuscous band on the basal third of the elytra **sayi**
- Smaller (about 6 mm.); humeral dilation narrow, at most elliptical 2
2. Basal three segments of the abdomen with a dorsal black vitta .. **burnetii**
- Base of abdomen without a dorsal black vitta 3
3. Elytra tinged with yellow, marked with an oblique black line near the basal third and four blackish spots on the apical margin **bonnetii**
- Elytra whitish-hyaline, without a distinct oblique black vitta or four apical spots **westwoodi**

A. westwoodi Fitch.

Trans. N. Y. St. Agr. Soc., xvi, 394, 1856.

Paler and less clearly marked than the preceding, the elytra without the yellowish tinge and black markings. It has about the same distribution as the preceding and should be found in Connecticut.

A. bonnetii Kirby.

Trans. Linn. Soc. Lond., xiii, 21, 1819.

The four apical spots and oblique vitta seem to be the best characters by which to distinguish this species. It has been reported from Ontario to Georgia.

Cornwall, 18 July, 1921 (B. H. W.).

A. burnetii Fitch.

Trans. N. Y. St. Agr. Soc., xvi, 395, 1856.

Still paler and less distinctly marked than the preceding but readily distinguished by the short black stripe on the base of the abdomen. Inhabits the northern states and should occur in Connecticut.

A. sayi Ball.

Can. Ent., xxxiv, 259, 1902.

Very distinct by its large size and the ligulate appendage near the base of the elytra. It is known only from its type locality near Buffalo, N. Y., but there is no reason why it should not be found in suitable situations in Connecticut.

Otiocerus Kirby.

A genus of frail pretty insects remarkable for their strongly compressed foliaceous head, quite extinguishing the front, the lateral carinae of the vertex being greatly developed and continuous with those of the front. The division of the second antennal joint into two to four filaments is also peculiar to this genus so far as our fauna is concerned. These antennal filaments are generally shrivelled and tortuous so it is difficult to be sure of their relative lengths but they seem to be about equal. The ocelli are wanting.

Key to Species.

1. General color light or dark rufous 2
General color pale yellow or whitish 3
2. Larger, 11 mm.; elytra with a short whitish line beyond the tip of the clavus *degeeri*
Smaller, 8 mm.; elytra with an oval pale spot on the apical margin in addition to the commissural line *stollii*
3. Elytra hyaline with sanguinous veins but otherwise unmarked; length about 7 mm. *schellenbergii*
Elytra with markings other than the colored veins 4
4. Elytra whitish, quite evenly dotted with fuscous points 5
Elytra with few if any fuscous points, length 10-11 mm. 6
5. Elytra with many fuscous points but without other markings, length 8 mm. *abbottii*
Elytra with a fuscous mark at the tip of the clavus, another at base of the membrane, and indications of an oblique vitta along the subapical transverse veins; fuscous points more variable in size; length 10 mm. *francilloni*
6. Elytra with a vitta from the apex of the clavus to the apex of the costal margin *kirbyii*
Elytra with a vitta from the base of the corium to the apex of the clavus in addition to that found in *kirbyii* 7
7. Elytra clear yellowish white, without dots, the vittae sanguinous, the apical sending a branch along the sutural margin of the membrane to the middle of the apical margin; the radial vein with a short sanguinous vitta before the middle *coquebertii*
Elytra with a few scattering dots, the vittae fuscous 8
8. Head with a red vitta from the eye to the tip where it ends in a short black line; elytral vittae faint *wolfii*
Head with the red vitta below the line of the eye, sometimes obscure; elytral vittae distinct 9
9. Elytra beyond the transverse veins largely fuscous with a large apical pale spot; fuscous dots few, on the basal half of the elytra only *signoretii*
Elytra with the apical vitta not at all expanded; fuscous dots small and confined to the apical areoles *amyotii*

O. degeeri Kirby.

Trans. Linn. Soc. Lond., xiii, 16, 1819.

This large sanguinous or dark red form is common in New York state and seems to be distributed throughout the eastern United States and Canada.

Canterbury, 14 Aug., 1905, Portland, 10 Aug., 1913, Cornwall, 18 July, 1921, North Branford, 1 Aug., 1922 (B. H. W.); Hamden, 15 Aug., 1921 (P. G.).

O. stollii Kirby.

Trans. Linn. Soc. Lond., xiii, 16, 1819.

Colored much as in *degeeri* but a much smaller species. I have taken it only on oaks. It is found from New York southward and should be taken in Connecticut.

O. schellenbergii Kirby.

Trans. Linn. Soc. Lond., xiii, 18, 1819.

A small pale species with the same distribution as the preceding and must be found in Connecticut.

O. abbotii Kirby.

Trans. Linn. Soc. Lond., xiii, 17, 1819.

This small dotted form is apparently rare in the North.

Guilford, 13 July, 1920 (B. H. W.).

O. francilloni Kirby.

Trans. Linn. Soc. Lond., xiii, 17, 1819.

Reported from New York to Georgia and probably lives in Connecticut.

O. kirbyii Fitch.

Homop. N. Y. St. Cab., 46, 1851.

Known only from New York but probably will be taken in Connecticut.

O. coquebertii Kirby.

Trans. Linn. Soc. Lond., xiii, 18, 1819.

The most abundant and the most beautiful species of the genus.

Hamden, 14 July, 1921 (P. G.); Brookfield (E. L. D.).

O. wolfii Kirby.

Trans. Linn. Soc. Lond., xiii, 19, 1819.

Another common species found on hickory trees from New York to Georgia and should be taken in Connecticut.

O. signoretii Fitch.

Trans. N. Y. St. Agr. Soc., xvi, 394, 1856.

Reported from New York to Texas and should be found in Connecticut.

O. amyotii Fitch.

Trans. N. Y. St. Agr. Soc., xvi, 394, 1856.

Same distribution as *signoretii*, but not common.

New Haven, 17 July, 1912, 28 June, 1920 (B. H. W.).

Subfamily DELPHACINAE.

Small insects readily distinguished by the presence of a large movable spur at the apex of the hind tibiae. They are usually abundant in low grassy meadows and about the borders of streams.

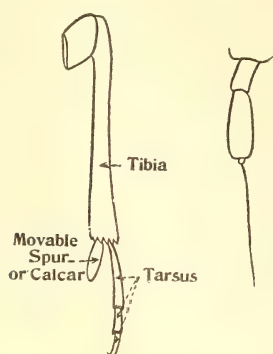


FIG. 3. *Liburniella ornata* Stål,—Leg and antenna greatly enlarged. Drawn by Dr. Philip Garman.

Key to Genera.

1. Lateral carinae of the pronotum attaining the hind edge or becoming obsolete a little within the margin 2
Lateral carinae of the pronotum deflected outwardly behind the eyes, not directed toward the hind edge 8
2. Median carina of the front normally narrowly forked below the apex of the head, the branches usually obscure where they pass over the apex; lateral carinae of the pronotum sometimes abbreviated at about the middle of the pronotal disk; face with a pale band crossing the base of the clypeus *Pissonotus*, p. 48
Median carina of the front running to the apex of the head; face without a transverse pale band on the base of the clypeus 3
3. Front narrow or a very little wider below; the sides rectilinear 4
Front broader below or oblong 5
4. Vertex produced for nearly or quite one-half its length before the eyes; lateral carinae of the pronotum rectilinear *Stenocranus*, p. 46
Vertex scarcely surpassing the eyes; lateral carinae of the pronotum bowed outward on the disk *Stobaera*, p. 51
5. Front oblong, a little wider above the antennae; apex of the head rounded, the carinae nearly obsolete there *Kelisia*, p. 46
Front ovate or distinctly wider below near its apex; apex of the head produced, sharp, the carinae there prominent 6
6. Form slender, linear; vertex produced before the eye for nearly or quite the length of the eye, conical at apex; the median carina obsolete and not continued over to the front; front elliptical, its base acute, the apex truncated, the median carina obsolete or nearly so *Megamelanus*, p. 47
Form sometimes slender; vertex less produced, truncated at apex, the lateral carinae of the front continued over on to the vertex 7
7. Front ovate, its sides much arcuated below, nearly rectilinear above to the narrow base; form slender *Prokelisia*, p. 47
Front less widened to its apex; form broader ovate *Megamelus*, p. 48
8. Front with one median carina 9
Front with two median carinae 12
9. Anterior and sometimes the intermediate tibiae foliaceous *Phyllodinus*, p. 50
Anterior and intermediate tibiae slightly if at all expanded 10

10. Lateral carinae of the pronotum and the front on either side with a row of crater-like pits; front broad, but little exceeding the eyes **Laccocera**, p. 51
 Crater-like pits wanting on the front and lateral pronotal carinae 11
11. Oblique apical carinae of the vertex obsolete or nearly so, leaving the lateral compartments of the vertex continuous with those of the front; median dorsal line white, bordered with black; elytra with a broad angled fuscous vitta **Liburniella**, p. 52
 Oblique carinae at apex of the vertex more or less obvious, when obsolete the median carina also obsolete, the lateral compartments of the vertex not continuous with those of the front ... **Liburnia**, p. 52
12. Mesonotum with five carinae; insect large, green [**Pentagramma**]
 Mesonotum with three carinae, sides of the pronotum and face with pitted granules; insects brachypterous, larvae of **Megamelus**, p. 48

Stenocranus Fieber.

Slender flavo-testaceous insects with a median white dorsal vitta and on each elytron a longitudinal fuscous vitta in the median apical cell. Length 4-5 mm. They live on the various meadow carices.

Key to Species.

Front black with white carinae **dorsalis**
 Front brown with white carinae **dorsalis** var. **vittatus**
 Front concolorous **felti**

S. dorsalis (Fitch).

Homop. N. Y. St. Cab., 46, 1851.

A familiar object about Carices everywhere east of the Rocky Mountains, and must be common in suitable locations in Connecticut. These insects and the *Cymus* found with them mimic the chaff of the *Carex* so perfectly that they are hard to detect when seen together in the collecting net.

S. dorsalis var. **vittatus** (Stål). *lautus* Van Duzee.

Berl. Ent. Zeit., vi, 315, 1862.

Collinsville, 8 Sept., 1916 (W. E. B.); Hamden, 25 Sept., 1921 (B. H. W.).

S. felti Van Duzee.

Trans. Am. Ent. Soc., xxxvi, 88, 1910.

A shorter and broader form with less strongly contrasting colors. It was described from New Hampshire, has been taken in New York and may occur in the hilly portions of Connecticut.

Kelisia Fieber.

Similar to the preceding genus in form and color but distinct by its broader form and shorter blunt vertex.

Key to Species.

- Brownish-testaceous with a fuscous vitta behind each eye which is continued along the axis of the elytron **axialis**
 Pale flavo-testaceous with a dorsal white line which is reproduced on the front **crocea**

K. axialis Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 232, 1897.

Like all its relatives this is found in swampy meadows. The wingless form is common with the elytra shorter and more lanceolate. It is less abundant than *Stenocranus dorsalis* but like that is distributed throughout the eastern United States and Canada.

New Haven, 20 Aug., 1909 (B. H. W.).

K. crocea Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 233, 1897.

This pale yellowish species is most at home in the Mississippi Valley but it has been taken at Faneuil, Mass. In certain characters it recalls *Stenocranus*.

New Haven, 8 Aug., 1920 (B. H. W.).

Megamelanus Ball.

Small slender insects with a long pointed head. They are found on *Sparta* and related grasses. Length 3-4 mm.

M. spartini Osborn.

Ohio Nat., v, 375, 1905.

The females are pale yellowish while the males are darker with the apex of the elytra smoky. They are common about New York City and must occur in southern Connecticut.

Prokelisia Osborn.

I am separating this genus from *Megamelus* by its more slender form and more ovate front with the sides more strongly arcuated. Some individuals in this genus, as in *Kelisia* and *Megamelanus*, have the elytra shorter and more lanceolate with the wings aborted.

Key to Species.

- Testaceous marked with black on the abdomen, the frontal carinae lined with black; length 3-3.5 mm. **marginata**
 Flavo-testaceous, nearly unicolorous or with the head a little smoky; length 2.5-3 mm. **setigera**

P. marginata (Van Duzee).

Bull. Buff. Soc. Nat. Sci., v, 234, 1897.

Common throughout the United States and Canada.

Stratford, 21 July, 1908 (B. H. W.).

P. setigera Osborn.

Ohio Nat., v, 373, 1905.

Described from Louisiana but common in Massachusetts and undoubtedly occurs in Connecticut. Apparently a sea-coast species and probably lives on some shore grass.

Megamelus Fieber.

In this genus the vertex is produced before the eyes but less so than in *Stenocranus*, the carinae are sharp and prominent over the apex of the head and the front is broader below with the sides sometimes a little arcuated. Crawford's use of this generic name in 1914 is unwarranted and unscientific.

Key to Species.

1. Flavo-testaceous varied with fuscous or brown; face with a transverse brown band covering the clypeus **notulus**
2. Tibial spur normal; color almost uniformly piceous-brown **piceus**²
- Tibial spur very large, ovate, flat, wider than the front and nearly as long; frontal carinae pale **davisi**

M. notulus (Germar).

Thon's Ent. Archiv., ii, 57, 1830.

I have taken this species on marshy fields in New York, New Hampshire and Ontario and it must occur in Connecticut. The young have the median frontal carina forked almost to its base and the head and pronotum ornamented with "crater-pits."

M. piceus Van Duzee.

Mich. Agr. Expt. Sta., Bull. 102, 8, 1894.

A small piceous species marked with pale on the vertex, venter and about the coxae. It has been taken from Long Island to Michigan and may occur in Connecticut.

M. davisi Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 235, 1897.

A little larger than *piceus* with pale facial carinae and a dark mark at apex of the clavus. It has the front broader and more ovate below and is remarkable in its greatly enlarged and flattened tibial spurs. Its home is on water plants and its large spurs undoubtedly support it when by a mischance it lands on the water. Those who consider the form of the spur a character of primary importance would undoubtedly found a new genus for this species but I can see no occasion for so doing. The enlarged spur occurs independently in *Stenocranus* and might be found in any of the related genera having species that live about the water.

Pissonotus Van Duzee.

The members of this genus are easily recognized by the transverse black band that crosses the base of the clypeus; usually the apex of the front is paler bringing the dark band into still stronger

contrast. There are two series of species found in this genus. In the first or typical group the insect is pale yellow to piceous, polished; apex of the head smooth with the carinae there obscure. This group of species much resembles *Megamelus* but has the median carina of the front forked distinctly below the apex of the head although the two branches are close together and obscure. The second division of the genus includes opaque brown species with pale carinae and elytral nervures and the frontal carinae distinct over the apex of the head. This genus and the more southern *Perigrinus* are amply distinct from *Dicranotropis* and there is no occasion for confusing them as has been done by Mr. Crawford.

Key to Brachypterous Forms.

1. Polished, fulvo-testaceous to piceous-black; elytral nervures concolorous and indistinct 2
 Opaque brown species with the elytral nervures usually pale 6
2. Color piceous or almost black 3
 Color fulvous or fulvo-piceous, at least on the elytra 5
3. Apical margin of the elytra pale 4
 Apical margin of the elytra concolorous, piceous *ater*
4. Anterior and intermediate tibiae black or nearly so *marginatus*
 Anterior and intermediate tibiae pale, lineate with brown .. *pallipes*
5. Head concolorous or paler than the pronotum and elytra .. *delicatus*
 Head and pronotum black or nearly so *guttatus*
6. Face with a broad white band crossing the apex of the front, base of front maculated *aphidioides*
 Face without a white band above the usual transverse black band 7
7. Lower surface and a broad longitudinal vitta on the tergum pale yellowish; elytral nervures concolorous *dorsalis*
 Coxae and apex of the front only pale; median vitta of the tergum but obscurely pale *brunneus*

P. marginatus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 236, 1897.

The black anterior and intermediate tibiae seem to be characteristic of this species and will serve to distinguish it from the closely related *pallipes*. It seems to be distributed throughout the United States and Canada and should be found in Connecticut. *Pissonotus basalis* Van Duzee will probably be found to be but the macropterous form of this species.

P. pallipes Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 238, 1897.

Smaller than the preceding with the feet entirely pale, lineate with brown. It also is a widely distributed form and must occur in Connecticut.

P. ater Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 237, 1897.

The concolorous hind margin of the elytra is the best superficial character by which to distinguish this species. It has been reported from New York to Florida.

Westville, 4 July, 1904 (W. E. B.).

P. delicatus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 237, 1897.

Distinct by its pale fulvous color with the legs lineate with brown and the elytra bordered behind with white. It is distributed from New Jersey to California and might be found in southern Connecticut.

P. guttatus Spooner.

Can. Ent., xlv, 233, 1912.

As suggested by Mr. Spooner, this will probably prove to be a distinct species from *delicatus*. It differs in having the head and pronotum nearly black, the latter bordered behind with white, the white on the apical margin of the elytra fading out toward either angle, and the legs without brown lines. It has been taken from southern Ontario to Florida and must occur in Connecticut.

P. dorsalis Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 239, 1897.

This species is intermediate between the two sections of the genus and serves to connect them. It has the opaque body of the *brunneus* group with the polished elytra and obscure neurulation found in the *marginatus* group. It has been reported from New York and Ohio and may occur in Connecticut.

P. brunneus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 239, 1897.

A plain looking little species well distinguished by the pale elytral neurulation and bears no resemblance to *pallipes* as suggested by Mr. Crawford. It is found throughout the eastern states and Canada.

Huntington, 9 July, 1920, New Haven, 14 June-3 Oct., 1920 (B. H. W.).

P. aphidioides Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 239, 1897.

A large species much resembling *brunneus* but well distinguished by the maculated face. It inhabits the other eastern states and doubtless Connecticut. *Pissonotus frontalis* Crawford is a closely related western species.

Phyllodinus Van Duzee.

Readily distinguished from related genera by the foliaceous tibiae. The typical species is opaque brown with a broad head and maculated front, while *flabellatus* is somewhat polished and has a narrower head.

Key to Species.

Elytra of the brachypterous form concolorous with white veins ..**nervatus**
 Elytra of brachypterous form brown with the apical margin white,
 the nervures concolorous**flabellatus**

P. nervatus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 241, 1897.

A stout square-looking insect which cannot well be confused with any other described Delphacid. It is found throughout the eastern United States and must occur in Connecticut.

P. flabellatus Ball.

Can. Ent., xxxv, 232, 1903.

A brown species with most of the pronotum, the scutellum and the apical margin of the elytra white, and the tergum with a series of short marks on either side and the dorsal line white. It has been reported from New York to the District of Columbia and should occur in Connecticut. *Phyllodinus koebeleri* Osborn, described a few months later, seems to differ very little if at all from this species.

Laccocera Van Duzee.**L. vittipennis** Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 242, 1897.

This very distinct species has the short square head of the preceding genus but can at once be distinguished by the row of pitted granules on the front and pronotal carinae. It is mostly black, with a broad white vitta on either side below and a broader one on the dorsum, leaving the basal angles of the scutellum deep black. The milky elytra have a fuscous vitta along the suture and a short discal one at apex. This species is found in New Hampshire and may occur in Connecticut.

Stobaera Stål.

This genus can be roughly distinguished by the maculated elytra with conspicuously punctated nervures; the rather large and pustulated antennae, the narrow and sometimes transversely banded front. The lateral carinae of the pronotum follow nearly the contour of the eye until they bend abruptly to the hind margin.

Key to Species.

- Face crossed by a brown band between the eyes followed by a creamy white one and that by a black one on the apex of the front;
 clypeus pale **tricarinata**
 Face pale brown, darker between the eyes, marked with a transverse white line at the lower angle of the eyes and a few white points
pallida

S. tricarinata (Say).

Jour. Acad. Nat. Sci. Phila., iv, 237, 1825.

In this species the elytra are marked with an oblique fuscous vitta from the pterostigma to the inner apical angle. This vitta gives off two branches to the apical margin, the inner broader and returning along the margin toward the inner angle. Mr. Craw-

ford sinks *concinna*, *affinis* and *minuta* as synonyms of this species but with our present knowledge of the life history of these insects we must keep them distinct. This species is distributed over nearly the whole of the United States and Canada.

New Haven, 16 Oct., 1903 (H. L. V.).

S. pallida Osborn.

Ohio Nat., v, 375, 1905.

Here the elytra are marked with a brown vitta from near the base to a fuscous mark at the apex of the clavus where it is deflected to the stigma then back to the inner apical angle and again along the apical margin. This species has the broad short vertex of *concinna* and somewhat the same elytral markings. It has been recorded from New York to Florida and should be found in Connecticut.

Liburniella Crawford.

This genus has the narrow front of *Stenocranus*, the elytral markings nearly of *Stobaera*, while the pronotal carinae are those of *Liburnia*.

L. ornata (Stål). (Fig. 1.)

Berl. Ent. Zeit., vi, 315, 1862.

Easily distinguished by the narrow white dorsal vitta bordered on either side by a black line, the black front with white carinae, and the broad fuscous vitta on the elytra from the stigma to the inner apical angle and back to the outer apical angle; there is also a brown cloud on the base of the corium. It is a very pretty species and is found throughout the United States and Canada.

New Haven, 4 Nov., 1903 (H. L. V.), 4 July, 1920 (B. H. W.); Hamden, 5 July, 1920 (P. G.); Cornwall, 22 Oct., 1920 (B. H. W.).

Liburnia Stål.

This is a large and difficult genus that is badly in need of revision.

Key to Species.

1. Frontal carinae prominent and continued over the apex of the head to connect with those of the vertex 2
Frontal carinae interrupted at the apex of the head, not continuous with those of the vertex 9
2. Front pale with the carinae bordered by a black line; insects pale yellowish-testaceous; tergum black, at least in part **detecta**
Frontal carinae not bordered by a black line on a pale ground .. 3
3. Front black with pale carinae 4
Front pale 7
4. Larger (3 mm. to tip of abdomen); vertex and pronotum white; body black varied with fulvous **pellucida**
Small (2 mm. to tip of abdomen) 5
5. Apex of the clavus with a short fuscous line; pronotum white posteriorly **puella**
Apex of the clavus without a fuscous line 6

6. Color mostly dark brown or black, the base of the tergum with a fulvous vitta; frontal carinae slenderly pale **basivitta**
Pale colors more extended; vertex, pronotum and scutellum whitish, the former with two black points; basal fulvous band of the tergum carrying a median black spot and behind the band a pale dorsal line; frontal carinae conspicuously white **foveata**
7. Color of the scutellum fulvous or with the basal angles black in the male; tergum without a dorsal pale vitta **osborni**
Color, including scutellum, soiled or testaceous-yellow; dorsal line of the tergum pale 8
8. Tergum brown or blackish brown, darker along the sides; margin, apex and slender dorsal line pale yellowish **lateralis**
Tergum black; margin, apex and a broad dorsal vitta whitish **kilmani**
9. Front narrow, the sides straight, parallel or nearly so; color pale yellowish, female nearly immaculate, male with the basal angles of the scutellum and disk of the pleural pieces black, the abdomen deep orange, marked with black **campestris**
Front broad, its sides distinctly arcuated 10
10. Color black in the male, pale yellowish in the female, with the frontal carinae margined with pale **lineatipes**
Color obscure brown varied with paler in both sexes 11
11. Male stiles but little divergent, their slender tips approximate above **lutulenta**
Male stiles above strongly divergent, their apical two-thirds broad and nearly horizontal **vanduzeei**

L. pellucida (Fabricius).

Ent. Syst., iv, 7, 1794.

A rather large stout species of a testaceous-white color with the face, pleural pieces and abdomen mostly black. The male generally has a transverse fulvous vitta on the base of the tergum. The clear white frontal carinae on a black ground are a conspicuous character. This imported species is distributed throughout the northern states and Canada from the Atlantic to Colorado and British Columbia.

New Haven, 8 July, 1912.

L. puella Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 250, 1897.

A small slender species, mostly black with the frontal carinae and hind margin of the pronotum white. The elytra are whitish-hyaline with a longitudinal fuscous mark on the apex of the clavus. This species is distributed throughout the United States and sub-tropical America and has been reported from the Hawaiian Islands and Australia.

New Haven, 16 Oct., 1903 (H. L. V.), 23 June, 1904 (P. L. B.).

L. basivitta Van Duzee.

Bull. Buff. Soc. Nat. Sci., ix, 202, 1909.

Has the general aspect of *puella*, but here the frontal carinae and hind margin of the pronotum are scarcely paler and the commissure wants the fuscous mark at the apex of the clavus. Found throughout the eastern states and undoubtedly occurs in Connecticut.

L. foveata Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 257, 1897.

Much like the brachypterous form of *basivitta* and like that species marked with a fulvous band on the base of the tergum. It may be distinguished by having the vertex, pronotum and scutellum whitish-testaceous and the frontal carinae more conspicuously pale. Reported from New York and may occur in Connecticut.

L. osborni Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 250, 1897.

A pretty yellowish or fulvous species with conspicuous black spots on the lateral angles of the male scutellum. It need not be confounded with *campestris* which has the carinae obscure on the rounded apex of the head. It is found throughout the eastern states and should inhabit Connecticut.

L. lateralis Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 253, 1897.

In this species the front is light brown with pale yellowish lines and dots; the dorsum is pale with a broad brown or blackish vitta on either side. It may be distinguished from the next by its having the median one-third of the tergum pale brown with a slender whitish median line. It inhabits the northern states and Canada.

New Haven, 23 June, 1904 (P. L. B.).

L. kilmani Van Duzee.

Bull. Buff. Soc. Nat. Sci., 253, 1897.

Near the preceding but differs in having a slightly broader front, the pro- and mesonotum pale, and the broad dorsal vitta on the tergum without a slender whitish median line. The male genital characters are also very distinct, the stiles being narrow, pointed and widely divergent in the present species while they are much wider and more parallel in *lateralis*. In both species the brachypterous elytra are brown and polished, with a pale marginal nervure. Like *lateralis* this species inhabits the northern states and probably Connecticut.

L. detecta Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 248, 1897.

This species has a broader front on which the white carinae are conspicuously bordered with black, leaving a median fulvous line in the axis of each compartment; the vertex and pronotum are whitish with the foveae more or less blackish, and the scutellum is fulvous. As in many of our *Liburnias* the abdomen is black with the base of the tergum marked with a fulvous vitta. It is distributed from New York to Florida and must occur in Connecticut.

L. campestris Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 254, 1897.

A small pale yellowish species in which the female is almost immaculate while the male has a conspicuous black spot on the pleural pieces and basal angles of the scutellum, and the abdomen is fulvous-red marked with black. It is common on grass lands and is widely distributed in the United States and Canada. This species has been sunk as a synonym of *arvensis* by some, and the Fitch collection at Albany does have a typical male *campestris* placed among the *arvensis* material. Dr. Fitch, however, gives the length of his species as .17 of an inch while this is but .12 of an inch, and he states that his is immaculate while including both sexes in his description. So for the present, at least, nothing can be gained by sinking *campestris* as a synonym of *arvensis*. There is a large pale species, not uncommon in New York State, which answers entirely to Fitch's description but I have not been able satisfactorily to locate its male and it may prove to be a dimorphic form of *pellucida*.

New Haven, 13, 30 May, 1911 (B. H. W.).

L. lineatipes Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 255, 1897.

A small nearly unicolorous species of which the males are black and the females pale yellowish. The front is rather broad, oval, and truncated at apex as well as at base, and the legs are testaceous, lineate with brown. It is distributed from New York to California and undoubtedly occurs in Connecticut.

L. lutulenta Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 252, 1897.

This is a dull brown species, varied with paler brown, with a rather broad oval front, marked, as in *lineatipes*, by black lines next the carinae in pale examples. It ranges from Massachusetts to Colorado.

New Haven, 3 Oct., 1902, 13 May, 1 June, 1911 (B. H. W.).

L. vanduzeei (Crawford).

Proc. U. S. Nat. Mus., xlv, 622, 1914.

Very near *lutulenta*, apparently a little larger with different male genitalia. Described from Massachusetts and should be found in Connecticut.

Family CICADELLIDAE.

Jassina Stål.*Jassoidea* Van Duzee.

By DWIGHT MOORE DeLONG, PH.D.*

Meadows and old pastures, especially those of long standing, are ideal places for the development and hibernation of members of this family, and they usually harbor a large number of species, and also are prolific sources of infestation for adjacent agricultural crops. A few of the smallest and most abundant species frequent the orchard and cause serious injury to many important fruits. Their attacks are not confined to the pasture and orchard, but one may find them as pests of nurseries, vegetable gardens, forage crops, vineyards, ornamental plants, shrubs and trees.

Direct injury by leafhoppers is manifested in many ways; most characteristic is the discoloring, drying and shriveling of grasses and foliage, and often the curling or distorting of leaves, as in the case of potato "tip burn." These are results of leafhopper feeding, and are caused by puncturing the leaf with the proboscis in order to obtain the plant juices. By this constant drain the plant is often killed or the vitality greatly reduced.

The blasting of heads of grain is often definitely attributed to certain species of leafhoppers, and the deposition of eggs is a further source of injury, for in many cases these are placed in small incisions made through the outer covering of the leaves, stems or twigs. Indirect injury may also occur, for recently they have been definitely and specifically proven to carry certain fungous and bacterial diseases of plants.

The number of broods a season will vary with the species, and certain of our common forms produce one or two distinct broods during the summer. The great number spend the winter in the egg stage, and develop during spring and early summer. Others hibernate as nymphs or adults according to the species.

Bogs, swamps, sand plains, meadows and various types and stages of forests each have a rather well defined group of plants which live under somewhat restricted conditions. Certain species of "Jassids," or groups of species, are quite closely associated with the plant societies which occur in these areas, and the plant distribution seems to control to a large extent the species distribution. The meadow group is by far the most important. Here are found more species of insects because of the great variety and variation in the type of meadows and the large number of factors which combine to produce diversified habitats.

* The author takes this opportunity to express his appreciation to Prof. J. G. Sanders, who has offered many helpful suggestions and criticisms and through whose kindness it has been possible to prepare this manuscript.

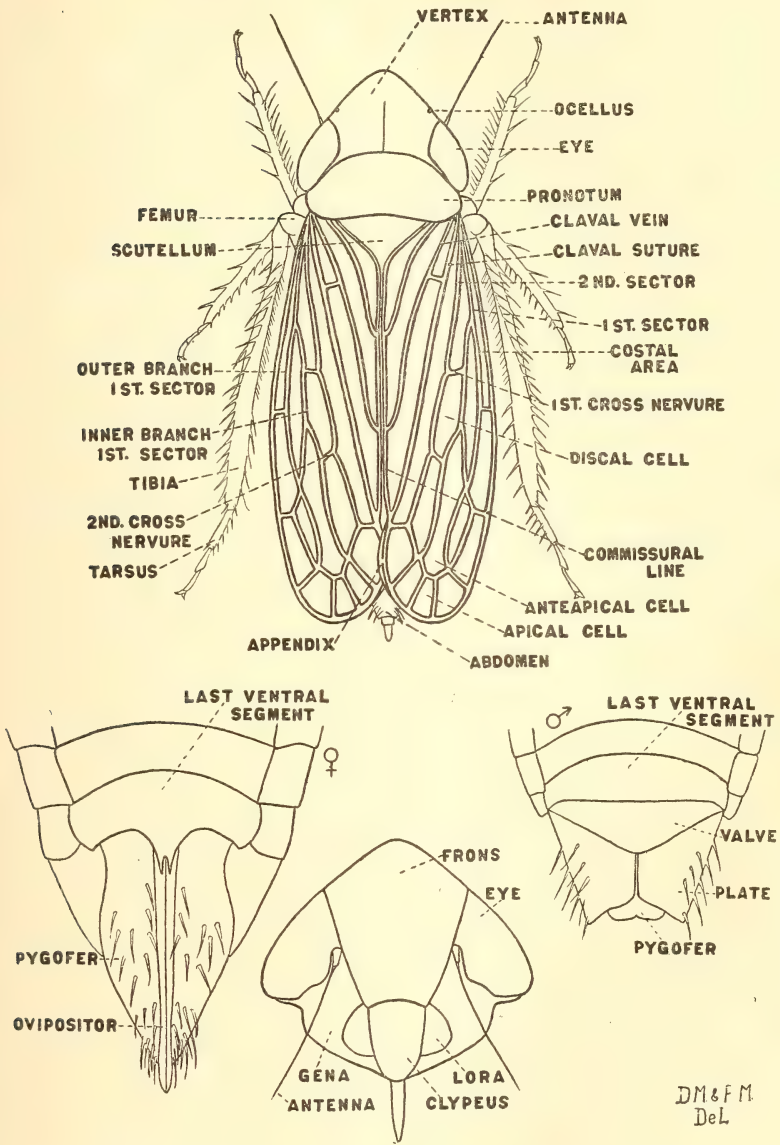


FIG. 4. *Deltocephalus configuratus* Uhler,—(Upper) Dorsal view. (Lower left) Female genitalia. (Lower right) Male genitalia. (Lower center) Face. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

This family as considered at the present time includes the leafhoppers closely allied in structure to the Cercopidae, Membracidae and Fulgoridae, and is placed systematically between the two latter families, but is easily distinguished from all of these by the double row of spines on the hind tibiae, the prominent but normal pronotum and the insertion of the antennae on the front between the eyes. A few forms like *Penthimia americana* Fitch, and certain of the *Gyponas* and *Acucephalini* resemble very closely the Cercopidae, but lack the circlet of large heavy spines at the distal end of the hind tibiae of the Cercopidae, and are armed with a double row instead. In the Membracidae the pronotum is greatly produced, often covering a large part of the dorsal portion of the body, and projects in curious structures formed at the sides or in front. The pronotum is normal in the Cicadellidae and forms only a dorsal covering of the thoracic region. As a group the Fulgoridae are most easily confused with this family. In the Fulgoridae the antennae are always beneath the eyes; the ocelli are beneath the eyes or sunken into the cheeks close to the eyes, and are separated from the keeled frons by a distinct and often conspicuous ridge at the sides. The pronotum is very short and usually keeled. Observation of the position and character of these structures should easily separate these two groups.

The Connecticut records of this group at present are of those which have been taken in general collecting, since no special collecting has been undertaken. For this reason the following list of species includes all which have been taken in adjoining states, and which doubtless occur in the state, and may be found by more extensive search.

Key to Subfamilies.

- | | |
|--|---------------------|
| 1. Ocelli not on front, either on disc or margin of vertex. (Fig. 5, 1a, 2a, 7b.) | 2 |
| Ocelli on front below margin of vertex. (Fig. 5, 4b and c.) | |
| BYTHOSCOPIINAE, p. | 58 |
| 2. Ocelli on disc of vertex usually distinct from the margin. (Fig. 5, 1a, 2a.) | 3 |
| Ocelli on margin of vertex or between vertex and front near margin, sometimes wanting (TYPHLOCYBINI). (Fig. 5, 7b.) | |
| JASSINAE, p. | 85 |
| 3. Body usually elongate, cylindrical, head often angulate. (Fig. 5, 1a, b.) | CICADELLINAE, p. 73 |
| Body usually dorso-ventrally flattened, broadly oval and with head usually broadly rounded or roundly angulate. (Fig. 5, 2a, b.) | |
| GYPONINAE, p. | 80 |

Subfamily BYTHOSCOPIINAE.

The chief characteristic of this subfamily and the one which will readily separate it from the other members of the family, is the position of the ocelli which are located on the front below the

margin of the vertex. The vertex is usually short and very broad, rounding to the front so that no definite margin is between them.

Key to Genera.

1. Anterior margin of the pronotum not produced beyond the anterior margin of the eyes, vertex distinctly and broadly rounded anteriorly. (Fig. 5, 6a.) 2
Anterior margin of pronotum strongly produced beyond anterior margin of eyes, vertex obtusely angulate. (Fig. 5, 4a.) 4
2. Head across eyes as wide as, usually wider than pronotum, humeral angles rounded, not prominent 3
Head, including eyes, narrower than pronotum which is widened by prominent humeral angles [Bythoscopus]
3. Elytra with large appendix, vertex very broadly curved before, almost straight. (Fig. 5, 6a.) *Idiocerus*, p. 61
Elytra with appendix very small or wanting, vertex more distinctly curved and produced anteriorly. (Fig. 5, 3.) .. *Agallia*, p. 59
4. Vertex strongly angled, striations on pronotum extending obliquely from median longitudinal line toward humeral angles (Fig. 5, 4a.) *Macropsis*, p. 66
Vertex more obtusely angled, pronotum with striation transverse or nearly so. (Fig. 5, 5a.) *Oncopsis*, p. 69

Agallia Curtis.

Comprised of small species varying from brown to dirty white, but usually the former color. Vertex well rounded almost parallel margined, head wider than elytra at base. Face as long as wide, elytra with an appendix.

Contrary to the feeding habits of most of this subfamily, the species of *Agallia* live almost entirely upon herbaceous plants. They are commonly found on grasses and sedges in pasture land, on the undergrowth in woodland, and are very common on clover and truck crops. A few of the most important economic species belong here.

Key to Species.

1. Pronotum marked with two round black spots on disc or the posterior half, often very small, length exceeding 3.5 mm. 2
Spots on anterior half of pronotum usually close to anterior margin, size smaller, 3 mm. in length *sanguinolenta*
2. Vertex marked with six black spots, and a pair of large round spots on the disc of pronotum; female segment roundly produced *oculata*
Vertex with few spots, pronotum with spots on posterior portion only 3
3. Narrow, elytra narrow in proportion, usually with a dark median longitudinal line on the anterior two thirds of pronotum 4
Broader, robust, almost 2 mm. wide, dark almost unicolorous, elytra short and broad *quadri-punctata*

4. Last ventral segment of female broadly roundly produced posteriorly, elytra almost unicolorous, vertex nearly parallel margined, with two black spots *constricta*
 Last ventral segment of female deeply emarginate, sutural margin of clavus light, vertex shorter at middle than next eyes, marked with four black spots *novella*

A. oculata Van Duzee.

Ent. Amer., vi, p. 38, 1890.

In size and general appearance resembling *novella* but with different markings and genitalia. Vertex with a median line, two large spots on disc and a pair of smaller ones next each eye, black. Pronotum with a pair of large round spots and a median line, black. A dark band across middle of elytra. Female last ventral segment slightly roundly produced. Length 4.5 mm.

This insect hibernates as an adult; the life cycle is not known.

New Haven, 20 March, 1921 (B. H. W.).

A. constricta Van Duzee.

Can. Ent., xxiv, 90, 1894.

Narrow, pale testaceous, a pair of spots on vertex and a pair on posterior margin of pronotum, black, elytra usually dark brown, nervures paler. Length 3.5-4 mm.

There is only one brood a year, and the adults appear in the spring. This species is found very commonly in uncultivated fields in pastures close to rubbish and in woodlands where there are leaves and sheltered places for hibernation. It feeds on numerous grasses.

New Haven, 18 May, 1916, 7 May, 1921 (B. H. W.).

A. novella (Say). *Macropsis nobilis* Forbes.

Jour. Acad. Nat. Sci. Phila., vi, 309, 1831.

A narrow wedge-shaped brownish species with four black spots on anterior margin of vertex and elytral suture light. The vertex is longer next eyes than at middle. Length 3.75 mm.

The species is single brooded passing the winter in the nymphal stage and becoming adult in midsummer. They feed on grasses and herbaceous plants and are abundant in fields and open woods.

New Haven, 14 July, 1920 (B. H. W.); Cornwall, 5 June, North Branford, 12 June, 1921, 16 June, 1922 (B. H. W.).

A. quadri-punctata (Provancher). *Ulopa canadensis* Van Duzee. (Figs. 5, 3.)

Nat. Can., iv, 376, 1872.

A rather short, very robust form, elytra broad, brownish with pale nervures. Two black spots on vertex and two on posterior portion of pronotum. Length 4 mm.

The adults appear in early spring and feed on a great variety of plants. They are commonly taken in fields, among weeds, in gardens, etc. One brood a year is known to occur.

New Haven, 31 Oct., 1903 (H. L. V.); 13 May, 1911, 10, 28 June, 14 July, 1920 (B. H. W.); 16 July, 1920, 9 May, 1921 (M. P. Z.); Branford, 21 July, 1920, Huntington, 9 July, 1920, Killingworth, 31 May, 1920, Orange, 22 June, 1920, North Branford, 30 May, 1920, 12 June, 1921, 16 June, 1922 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); Colebrook, 19 June, 1920 (P. G.); Hamden, 28 May, 1920 (P. G.); 28 May, 1922 (B. H. W.).

A. sanguinolenta (Provancher). *Bythoscopus siccifolius* Uhler.
Clover leafhopper.

Nat. Can., iv, 376, 1872.

A broad short *Agallia* with two large dark spots on vertex, pronotum without distinct markings and elytra brown with dark nervures, varying in color, often mottled. Basal angles of scutellum dark. Length 3 mm.

The most common and important species economically of the genus. It hibernates as an adult and can be found feeding very early in the spring. It is a pest of forage crops, especially abundant on clover and alfalfa, and seems able to exist under varied circumstances, whether meadows or dry sandy areas.

New Haven, 4 Nov., 1903 (H. L. V.); 4 Aug., 1909, 26 June, 1910, 8, 27 July, 1920, 20 March, 21 May, 1921 (B. H. W.); Orange, 15 Sept., 1920; Branford, 28 July, 1920, 26 May, 1921 (B. H. W.); Milford, 26 Sept., 1921 (B. H. W.); Hamden, 10 Apr., 1921 (B. H. W.); North Branford, 1 Aug., 1922 (B. H. W.); North Haven, 4 Sept., 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

Idiocerus Lewis.

This group may be characterized by the broad parallel margined head which exceeds the pronotum in width, and rounds to the front. Male antennae usually with disc-like swellings near the tip. Elytra exceeding the abdomen and with a distinct appendix.

The species that are known at the present time feed upon trees and shrubs both in nymphal and adult stages. Most of the species are confined to specific food plants belonging to *Salix*, *Crataegus* or *Populus*. The various species of willows especially harbor a variety of these forms.

They usually hibernate as adults, and most of the species are two-brooded.

Key to Species.

- 1. Vertex with two round black spots or a black band on the rounded crest between eyes 5
- Vertex without distinct round spots or bands 2
- 2. Almost unicolorous, green or yellowish, rarely with dark markings 3
- Elytra with a dark band along sutural margin, often interrupted by a light cross stripe *suturalis*
- 3. Length more than 5 mm. 4
- Smaller not over 4.75 mm., elytra yellowish or greenish hyaline *nervatus*

4. Triangular anteapical cell formed by outer fork of first sector before it joins costa, elytra greenish **pallidus**
No anteapical cell formed by outer fork of first sector. Elytra yellowish with iridescent tinge **duzeei**
5. Large robust species with a band on vertex between the eyes, sometimes broken into an irregular row of spots or blotches.... 6
Smaller, two spots but no band present on vertex 7
6. Pronotum light with dark markings on anterior half, elytra subhyaline with dark nervures **lachrymalis**
Pronotum darker without definite markings, elytra rather opaque with unicolorous or pale nervures **scurra**
7. Spots on vertex small and about twice their diameter from the eyes 8
Spots on vertex large and slightly more than their diameter from the eyes 11
8. Nervures of elytra usually alternating dark and white, without sutural stripe, pronotum and scutellum with markings 10
Nervures of elytra not alternating in color, greenish with a dark stripe along suture, pronotum unmarked **snowi**
9. Male antennae without discs, color pale, a narrow brownish band across apex of clavus, and apices of elytra smoky **cognatus**
Male antennae with discs, without definite band across apex of clavus 10
10. Dark colored, face with six longitudinal stripes, length 5 mm. **alternatus**
Lighter, face pale without stripes, length 4.5 mm. **verticis**
11. Species pale with a pair of angular black spots on vertex, pronotum and scutellum **crataegi**
Dark, fulvous with light markings 12
12. Clavus at base creamy yellow, elytra without dark coloration at center of costa **provancheri**
Clavus fulvous, usually with a pale stripe, center of costal area black **fitchi**

I. alternatus Fitch. *Idiocerus interruptus* Gillette and Baker.

Homop. N. Y. St. Cab., 59, 1851.

Brownish fuscous with two black spots on the vertex, face yellow with longitudinal dark stripes. Elytral nervures alternating white and dark. Length 5 mm.

Very common and abundant throughout New England on willows. The adults hibernate and can be collected from early spring to midsummer, and often in August.

Cornwall, 5 June, 1921, Thompson, 19 July, 1921 (B. H. W.).

I. cognatus Fieber. *Idiocerus distinguendus* Kirshbaum.

Cicadinen von Mittel Europa, 162, 1896.

A little larger than *verticis* which it closely resembles. Black spots on vertex very small, sometimes lacking, but always very prominent in nymphal stages. Pronotum smoky often with four black spots on anterior margin. Scutellum with two round black spots on disc. Elytra subhyaline, nervures alternating white and brownish, a narrow band across apex of clavus and tips of elytra brownish, iridescent. Male antennae without discs. Length 5 mm.

An European species recently reported for this country where it occurs in abundance on *Populus alba*. It is easily separated from *verticis*, which it resembles, by the lack of antennal discs.

New Haven, 27 June, 29 July, 3 Oct., 1920 (B. H. W.), Stratford, 1, 15 Sept., 1920 (B. H. W.), Hamden, 11 June, 1921 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.). On poplar.

I. crataegi Van Duzee.

Can. Ent., xxii, 110, 1890.

Very distinctly marked, greenish yellow to brown with a pair of dark spots on vertex, anterior border of pronotum and basal angles of scutellum. Elytra yellowish hyaline with dark veins. Length 4.75-5.25 mm.

As its name would indicate this species occurs on different species of *Crataegus*. It is a typical northern form and is common in New England.

I. duzei Provancher. *Idiocerus perplexus* Gillette and Baker.

Pet. Faune Ent. Can., iii, 292, 1890.

Resembling *pallidus*, a little larger, pale, with golden iridescent elytra, fuscous at apex. Length 6-7 mm.

This is apparently a rather rare species in New England, but should be found in the state. It occurs on poplars and especially cottonwood.

Portland, 25 July, 1920, 24 July, 1921 (B. H. W.).

I. fitchi Van Duzee. *Idiocerus maculipennis* Fitch.

Can. Ent., xli, 383, 1909; Homop. N. Y. St. Cab., 59, 1851.

Chestnut brown, two black spots on vertex. Pronotum with an irregular black blotch on anterior margin behind either eye. Elytra brownish hyaline, nervures dark brown, a broad milky white band along claval vein curved to commissural line at half its length; middle of costal margin and apex black or brown. Length 5-5.5 mm.

Common throughout the state on *Crataegus* and apple.

New Haven, 3 Aug., 1909, 8, 25 July, 1912, 20, 22, 26, 27 June, 1914 (B. H. W.); 28 July, 8 Aug., 1920 (on apple), Wallingford, 8, 28 July, 1912 (D. J. C.); Manchester, 30 Aug., 1912 (H. B. K.); Portland, 25 June, 1922 (M. P. Z.).

I. lachrymalis Fitch. (Fig. 5, 6.)

Homop. N. Y. St. Cab., 58, 1851.

Large, particularly female specimens, varying from yellow to brown or slate color. A transverse band on vertex between eyes, and a spot next either eye dark. Basal angles of scutellum and a median stripe forming a spot on disc, brown. Nervures of elytra dark brown. Length, male 5.5 mm., female 7 mm.

A common species in New England and the Northern States, feeding upon cottonwood and other poplars.

Portland, 25 July, 1920 (B. H. W.); New Haven, 19 June, 1921 (B. H. W.). On poplar.

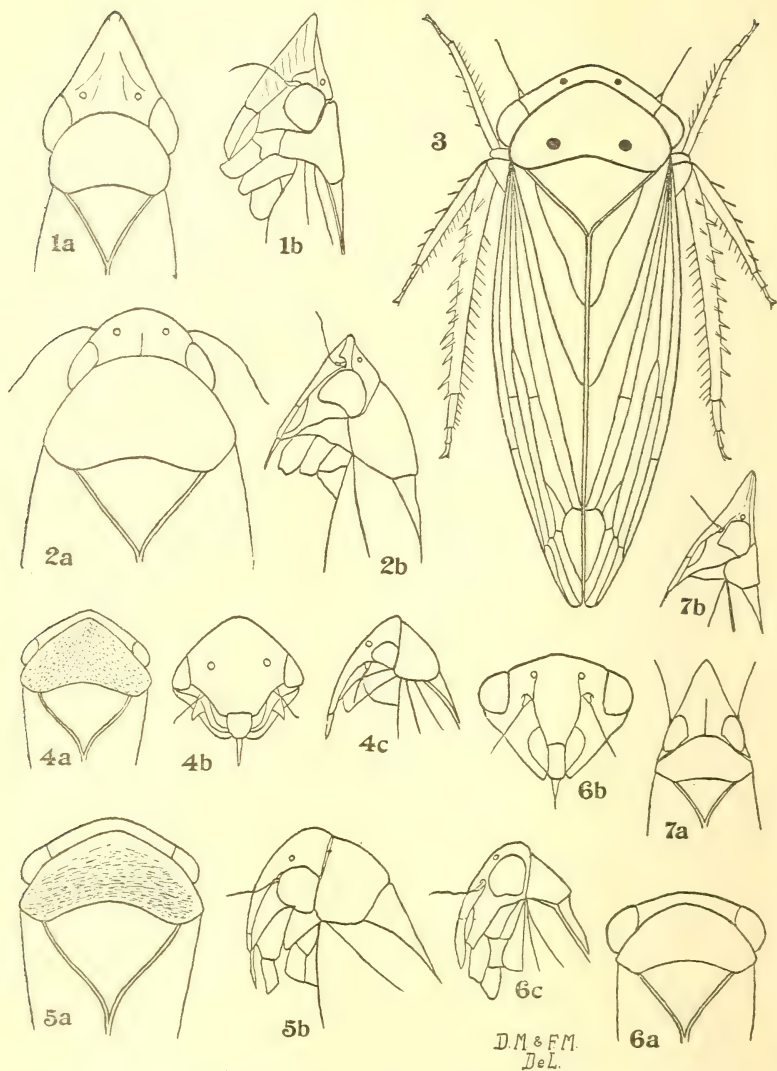


FIG. 5. (1a) *Draeculacephala mollipes* Say,—head, dorsal view; (1b) same, lateral view. (2a) *Gypona pectoralis* Spangberg,—head, dorsal view; (2b) same, lateral view. (3) *Agallia quadripunctata* Provancher,—dorsal view. (4a) *Macropsis viridis* Fitch,—head, dorsal view; (4b) same, face; (4c) same, head, lateral view. (5a) *Oncopsis variabilis* Fitch,—head, dorsal view; (5b) same, lateral view. (6a) *Idiocerus lachrymalis* Fitch,—head, dorsal view; (6b) same, face; (6c) same, head, lateral view. (7a) *Platymetopius cuprescens* Osborn,—head, dorsal view; (7b) same, lateral view. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

I. nervatus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 194, 205, 1894.

One of the smallest of the group, pale in color, green or often yellow, without definite dark markings on vertex. Elytra hyaline with dark wing nervures showing through. Length 4.5-4.75 mm.

Common in swampy land on willow shrubs, being limited in its distribution by the species of willows upon which it feeds.

Portland, 24 June, 1921 (B. H. W.). On poplar.

I. pallidus Fitch. *Bythoscopus obsoletus* Walker.

Homop. N. Y. St. Cab., 59, 1851.

Larger than *nervatus* but similar in color, pale green, yellowish, or often white, unmarked. The nervures of the wings usually not distinct through elytra. Length 6 to 6.5 mm.

Abundant on willows and poplars. The adults can be found feeding on shrubs in May, June and July. It is a species distributed through the New England States, and should occur in good numbers.

New Canaan, 3 Sept., 1920 (B. H. W.); Stratford, 1 Sept., 1920 (B. H. W.); New Haven, 22 Aug., 1920, 19 June, 1921 (B. H. W.); Hamden, 18 July, 1920 (B. H. W.); Norwalk, 8 Sept., 1920 (B. H. W.); North Branford, 13 July, 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

I. provancheri Van Duzee. *Bythoscopus clitellarius* Provancher.

Can. Ent., xxii, 111, 1890; Pet. Faune Ent. Can., iii, 288, 1890.

Very strikingly and conspicuously colored. Shining reddish brown with a bright yellow area on basal portion of clavus along claval vein. Two large round black spots on vertex, elytra reddish brown more hyaline on posterior half, smoky at tips. Length 5-5.5 mm.

Common on hawthorn and other species of *Crataegus*. It has also been taken from oak and hickory. Occurs throughout the New England States, and is reported from Connecticut.

New Haven, 17, 27, 31, 22 Aug., 1920, 25 June, 18 Sept., 1921 (B. H. W.). On chokeberry, *Pyrus arbutifolia*.

I. scurra (Germar). *Jassus scurra* Germar. *Jassus crenatus* Germar. *Idiocerus germari* Fieber. *Idiocerus gemmismulon* Leonard and Crosby.

Fauna Ins. Eur., xvii, 11, 1834.

Rather large and robust, dull brown shading to yellow, usually with a well defined band on vertex between the eyes. Elytra with veins often alternating pale and dark. Claval veins usually pale along suture. Rather irregular dark markings on pronotum and scutellum. Length 6-7 mm.

An European form apparently introduced into this country, and now with rather wide distribution. It feeds on species of *Populus*, and has been taken as adult in April, May, September and October, thus it would appear to be two-brooded.

New Haven, 1 Oct., 1909, 4, 5 Aug., 1920; New Canaan, 3 Sept., 1920, 21 Oct., 1909; Bridgeport, 20 Sept., 1920; Norwalk, 8 Sept., 1920; Stratford, 1 Sept., 1920 (B. H. W.); Hamden, 20 May, 1920 (M. P. Z.).

I. snowi Gillette and Baker.

Hemip. Col., 79, 1895.

Another pale green species with two small spots on vertex and elytral suture narrowly black or brown. Elytra greenish hyaline, nervures margined with sparse pubescence. Length 5.5-7.5 mm.

Reported from New York, and perhaps occurs in Connecticut as an adult during July and August.

I. suturalis Fitch.

Homop. N. Y. St. Cab., 59, 1851.

Pale yellowish, characteristically marked by a broad dark stripe along the elytral suture, tips smoky. Scutellum with basal angles dark. Vertex and pronotum unmarked. Length 5-5.75 mm.

Occurs on poplars and willows and perhaps occasionally is found on birch, as it has been taken from that plant although not definitely known to be feeding upon it.

Hamden, 11 June, 1921 (B. H. W.).

I. suturalis var. **lunaris** Ball.

Can. Ent., xxxiv, 311, 1902.

Similar to preceding with sutural stripe interrupted by a lunate mark on middle of clavus. Tips of elytra smoky, appendices overlapping and appearing as a third elongated dark spot on elytra.

Often found in company with *suturalis* on willows and poplars. A common variety in the eastern states.

New Haven, 19 June, Cornwall, 18 July, 1921 (B. H. W.).

I. verticis (Say). *Jassus verticis* Say.

Jour. Acad. Nat. Sci. Phila., vi, 308, 1831.

Resembling *alternatus*, but smaller and lighter in color. Pale brownish often faded, vertex with two black spots. Basal angles of scutellum black. Elytra subhyaline, nervures alternately brown and white. Length 4.25-4.5 mm.

It is doubtful whether this species occurs in the state, but may be found in small numbers during July, August and September.

Macropsis Lewis.

Pediopsis Burmeister.

Vertex obtusely angularly produced, almost parallel margined, very short and broad. Pronotum broad, produced anteriorly beyond the anterior margin of the eyes (at least in American species), dorsally roughened by oblique striations extending from the median anterior margin to the humeral angles.

The members of this group, as in the preceding, are tree and shrub inhabiting and are apparently limited in their feeding habits

to a few species of trees. A great many occur on willows and poplars, a few on wild plum and honey locust. So far as known they are single-brooded, the adults being found in June and early July.

Key to Species.

1. General color above greenish or yellowish to orange, often with dark markings 2
General color above brownish or fuscous, sometimes marked with green or yellow 9
 2. Elytra greenish hyaline, or rather uniform brownish in the male 3
Elytra with dark markings maculate or in the form of bands 5
 3. Tip of vertex without black markings 4
A black spot at the pointed tip of vertex, propleurae unmarked
virescens var. *graminea*
 4. Male bright green with a black spot on propleura, length 5-6 mm.
viridis
Male without spot on propleura, elytra tinged with fuscous, less than 5 mm. in length *gleditschiae*
 5. Elytra without distinct transverse hyaline bands 6
Elytra with transverse hyaline bands crossing clavus 7
 6. Entire clavus and margin of suture to apex of corium black *suturalis*
Definite brown band across base of clavus and scutellar region *basalis*
 7. Elytra with two transverse hyaline bands 8
Elytra reddish brown with a single hyaline band across nervures at base of anteapical cells *ferrugineoides*
 8. Elytra broad, propleurae without black markings, no black spots in basal angles of scutellum *canadensis*
Elytra narrower, propleurae and angles of scutellum with black spots *bifasciata*
 9. Elytra brownish with two or three pale spots, scutellum with a black spot in either basal angle *trimaculata*
Elytra deep reddish brown, scutellum rather uniform in color *sordida*
- M. *gleditschiae*** (Osborn and Ball). *Pediopsis gleditschiae* Osborn and Ball.

Proc. Dav. Acad. Sci., vii, 67, 122, 1898.

Resembling *viridis* but smaller, stout, elytra of the males washed with fuscous. Propleura unmarked. Length 4-4.75 mm.

Found on honey locust from which plant it derives this name. A rather common species in the south and occasionally found farther north, the range and abundance depending largely upon the distribution of its food plants.

New Haven, 29 July, 1920 (B. H. W.); 8 Aug., 1920 (B. H. W.). Honey locust.

M. *virescens* (Gmelin) var. *graminea* (Fabricius). *Cicada graminea* Fabricius.

Ent. Syst., Suppl., 521, 1798.

Typical *virescens* is smaller than *viridis*, very narrow with a black spot at the base of hind tibia. The more common form is the variety *graminea*, which is conspicuously marked by a black spot at the tip of the angled apex. Otherwise the color is uniform greenish or yellowish, often sordid green. Length 5 mm.

An European form occurring in New England.

Noroton, 21 June, 1913 (A. H. Renshaw); Orange, 17 July, 1920; New Haven, 18, 28 July, 1920 (B. H. W.); Portland, 24 July, 1921 (B. H. W.); 25 July, 1922 (M. P. Z.).

M. viridis (Fitch). *Pediopsis viridis* Fitch. (Fig. 5, 4; a, b, c.)

Homop. N. Y. St. Cab., 59, 1851.

The common bright green form, rather large, robust, unmarked above. Propleurae of males usually marked with a small black spot. Abundant on willow. Length 5-5.5 mm.

A very common insect throughout the New England States on willow.

New Haven, 18 July, 1, 3 Aug., 1920, 4 July, 1921; Guilford, 13 July, 1920; Hamden, 18, 24 July, 1920, 11, 19 June, 1921; No. Branford, 13 July, 1920 (B. H. W.); Milford, 17 July, 1920 (B. H. W.); Ellington, 25 Aug., 1920; Cornwall, 18 July, 1921 (B. H. W.).

M. suturalis (Osborn and Ball). *Pediopsis suturalis* Osborn and Ball.

Proc. Dav. Acad. Sci., vii, 67, 119, 1898.

Green with a stripe either side of pronotum and entire clavus black, a narrow stripe extending along suture to apex of elytra. Length 6 mm.

Reported from New England. It should be found on willow in adult stage during June.

M. basalis (Van Duzee). *Pediopsis basalis* Van Duzee.

Ent. Amer., v, 171, 1889.

A rather blunt-headed species, easily recognized by the dark fuscous area on scutellum and base of elytra. The remainder of elytra is usually greenish hyaline. Vertex and pronotum yellowish or brown. Length 5.5 mm.

Abundant on poplars throughout New England. Occurs as adult during June and July.

Hamden, 11 June, 1921 (B. H. W.).

M. canadensis (Van Duzee). *Pediopsis canadensis* Van Duzee.

Pediopsis flavescens Van Duzee.

Can. Ent., xxii, 111, 1890.

Greenish yellow, elytra brownish with a transverse light band near base and another across the apex of the clavus. Vertex, pronotum and scutellum reddish brown or yellowish. Length 4.75 mm.

Reported from Maine and New York, so no doubt occurs in Connecticut. Adults have been collected from poplar during July.

M. bifasciata (Van Duzee). *Pediopsis bifasciata* Van Duzee.

Ent. Amer., v, 173, 1889.

Greenish often with a brownish tint with two quite definite bands, one on basal half of elytra and one at apex. The bands are usually somewhat oblique and often a little broken. Vertex, pronotum and scutellum reddish brown. Markings in male rather indistinct. Length 4.5 to 5.25 mm.

A common species on poplar and previously reported from New England.

M. ferrugineoides (Van Duzee). *Pediopsis ferrugineoides* Van Duzee. *Pediopsis bifasciata* Gillette and Baker.

Ent. Amer., v, 171, 1889.

Rusty brown, usually dark with a light band including the cross nervures of the elytra. Vertex and pronotum yellowish brown, scutellum darker. Length 5.5-6 mm.

Feeds on narrow-leaved willows. Professor Osborn has recorded it for Maine and it perhaps occurs in Connecticut.

M. trimaculata (Fitch). *Pediopsis trimaculata* Fitch. *Pediopsis insignis* Van Duzee.

Homop. N. Y. St. Cab., 60, 1851.

Dull brown, elytra with two or usually three white spots in a row on apical half of costa, nervures paler. Vertex and pronotum more yellowish brown, scutellum with darker basal angles. Length 4-4.25 mm.

This is reported from wild plum by Van Duzee. Three records are at hand.

Westville, 31 July, 1901; Hamden, 23 Aug., 1910 (W. E. B.); New Haven, 18 June, 1921 (B. H. W.); Cromwell, 27 Aug., 1920 (B. H. W.) on *Prunus pissardii*.

M. sordida (Van Duzee). *Pediopsis sordida* Van Duzee.

Can. Ent., xxvi, 89, 1894.

Rusty brown, often shading to yellow, elytra subhyaline in female with brownish areas. Male elytra often darker, chestnut brown. Vertex, pronotum and scutellum paler. Length 4.75-5 mm.

Reported from Maine by Professor Osborn, and its distribution should extend south and west of this locality.

Cornwall, 5 June, 1921, New Haven, 16 June, 1921 (B. H. W.). Both on willow.

Oncopsis Burmeister.

Bythoscopus Amyot and Serville.

Vertex short and broad, almost parallel margined, produced but obtusely angled. Pronotum produced anteriorly beyond the anterior margin of the eyes, the surface covered with transverse wrinkles or striations extending almost transversely across the pronotum. In this respect it is easily distinguished from *Macropsis* to which it is closely related. Elytra with a distinct appendix.

The members of this genus are arboreal and similar in that respect to all the genera of the Bythoscopinae except *Agallia*. Although one or two species are reported as collected from blueberry, feeding observations show them to be closely restricted to trees and shrubs such as birch, walnut, alder, hazel, etc.

The members of the genus are apparently single brooded, judging from numerous collecting records, the adults usually occurring in June and July.

Key to Species.

1. First sector branching so as to form five apical and three ante-apical cells 2
First sector branching but forming only four apical and two ante-apical cells **distinctus**
 2. Last ventral segment of female notched or concavely rounded but without projecting teeth either side of notch 3
Last ventral segment notched, with projecting teeth more or less pointed either side of notch 6
 3. Last ventral segment one-half longer than preceding, roundly produced from base, deeply notched at apex 4
Last ventral segment proportionately shorter, notch shallow 5
 4. Face very strongly convexly inflated, color above black shining, unmarked **tumidifrons** n. sp.
Face moderately inflated, not bulbous, above pale or with pale markings, clavus usually conspicuously marked **variabilis**
 5. Face black, notch broad and shallow giving segment a bilobed appearance **nigrinasi**
Face usually bright yellow, female segment rounded, posterior margin with small shallow notch **sobrius**
 6. Last ventral segment of female triangular, produced medially, apical teeth usually distinct 7
Last ventral segment of female not medially produced, notch almost obsolete, teeth often missing or very small **cognatus**
 7. Elytra dark, clouded, with whitish or hyaline areas 8
Elytra hyaline, nervures brown, apex clouded; vertex dark, a broad yellow band connecting ocelli **pruni**
 8. Size large 4.5-5 mm., last ventral segment strongly produced medially forming two large distinct teeth **fitchi**
Size smaller, 4 mm., last ventral segment but slightly produced medially, teeth short, rather distant **minor**
- O. variabilis** (Fitch). *Athysanus variabilis* Fitch. *Athysanus abietis* Fitch. *Macropsis clitellarius* Provancher. (Fig. 5, 5a, b.)

Homop. N. Y. St. Cab., 60, 1851.

As the specific name indicates, a great variation in color is found in a series of specimens. Often sulphur-yellow with an oblique black line along claval suture. A common form on alder is rusty brown with clavus pale yellow. Length 5 mm.

Abundant on birch and alder.

Branford, 5 July, 1904 (P. L. B.); North Branford, 8 June, 1912; Hamden, 30 June, 1913 (B. H. W.); New Haven, 17 June, 1904 (H. L. V.); 28 May, 1905, 14 July, 1909 (B. H. W.); Suffield, 21 May, 1917 (M. P. Z.); Huntington, 9 July, 1920; Orange, 22 June, 1920, 17 July, 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.).

***O. tumidifrons** DeLong, n. sp. (Fig. 6, 1-4.)

Size and form of *variabilis* which it resembles, but from which it differs by the greatly inflated face and its distinct coloration. Length 4.5 mm.

Vertex and pronotum similar in form to *variabilis*, very coarsely transversely striate, these striations are deeper and more pronounced than in any allied form. Face very strongly convexly inflated, appearing bulbous as seen from the side.

Color: Vertex, pronotum, scutellum and elytra black shining, unmarked, beneath rather bright pale yellow with ovipositor and a few faint spots on legs fuscous. Front black above from which

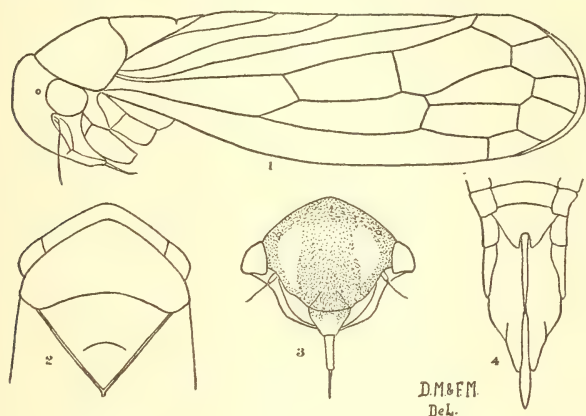


FIG. 6. *Oncopsis tumidifrons* DeLong.—(1) Lateral view. (2) Head, dorsal view. (3) Face. (4) Female genitalia. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

a very broad black stripe extends across face, terminating on base of clypeus. Eyes margined with black and a narrow line extends along outer margin of face to clypeus, so as to form a large oval yellow area near either side.

Genitalia: Female last ventral segment one-third longer than preceding, roundly produced from base with a U-shaped notch extending one-third the way to base.

Described from a single female from North Branford, Conn., collected June 8, 1912, by B. H. Walden, and kindly sent to me by Doctor Britton. As compared with allied forms it seems to deserve specific treatment here in view of the differences cited above.

O. sobrius (Walker). *Bythoscopus sobrius* Walker.

List Homop., iii, 874, 1851.

Vertex, pronotum and scutellum bright yellow, elytra darker, tawny to brown. Commissural margin along clavus and nervures pale. Length 5 mm.

Both nymphs and adults have been taken on birch.

Hamden, 14 June, 1911 (W. E. B.); Branford, 13 June, 1918; Rainbow, 13 June, 1916 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.).

O. cognatus (Van Duzee). *Bythoscopus cognatus* Van Duzee.

Ent. Amer., vi, 226, 1890.

Ashy brown, suture of elytra alternated light and dark, front dark. Vertex, pronotum and scutellum reddish brown. Female segment slightly concave. Length 5 mm.

Reported as feeding on hazel in Maine.

Portland, 5 June, 1914 (B. H. W.); Lyme, 16 June, 1918 (M. P. Z. and B. H. W.); Cornwall, 5 June, 1921 (B. H. W.).

O. fitchi Van Duzee. *Athysanus fenestratus* Fitch.

Check List Hemip., 65, 1916: Homop. N. Y. St. Cab., 60, 1851.

Pale to reddish brown, elytra infuscated, with whitish hyaline spots, nervures or many of them often broadly brown. Ocelli connected by a yellow band, vertex and front darker, yellow to brown. Length 4.5 mm.

It feeds on birch and perhaps willow, a form very similar to *minor*.

North Branford, 8 June, 1912 (B. H. W.); Guilford, 26 July, 1926 (M. P. Z.).

O. pruni (Provancher). *Bythoscopus pruni* Provancher.

Pet. Faune Ent. Can., iii, 290, 1890.

Ash-colored, usually dark, face yellow, vertex with a black band, elytra hyaline, veins black, a transverse band on cross nervures and apex of elytra dark. Length 4-4.5 mm.

A common species in early summer on wild plum and birch throughout the New England states.

New Haven, 7 July, 1920; Orange, 22 June, 1920; Portland, 25 July, 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); Litchfield, 22 July, 1920 (P. G.); Westport, 24 June, 1921 (W. E. B.).

O. minor (Fitch). *Athysanus minor* Fitch. *Macropsis ocellatus* Provancher.

Homop. N. Y. St. Cab., 60, 1851.

Resembling *fitchi* but smaller, with elytra more uniform in color, either hyaline or brownish. Female segment slightly produced medially, with a pair of short teeth including a shallow notch. Length 4 mm.

Reported as feeding on birch. Specimens from Connecticut are labeled "birch."

New Haven, 21 June, 1909 (B. H. W.); 9 June, 1914 (Q. S. L.); Hamden, 30 June, 1913 (B. H. W.) (on birch); Rainbow, 13 June, 1916 (B. H. W.); Orange, 22 June, 1920 (B. H. W.).

O. nigrinasi (Fitch). *Athysanus nigrinasi* Fitch. *Pediopsis flavescens* Provancher.

Homop. N. Y. St. Cab., 61, 1851.

Variable in color, yellowish to brown, elytra marked as in *fenestratus*, subhyaline, with two more or less conspicuous brownish transverse bands. Front usually black, female segment bilobed. Length 4 mm.

Reported from New York on hornbeam, and from Maine on hazel and *Viburnum*. This conspicuously marked form should occur in Connecticut from June to August.

O. distinctus (Van Duzee). *Bythoscopus distinctus* Van Duzee.

Ent. Amer., vi, 224, 1890.

Easily separated from the others of the genus by the two antepical and four apical cells. Elytra subhyaline with dark markings on basal half and apex. Vertex and pronotum yellowish, punctures coarse and black. Length 3.5-4.5 mm.

Reported by Van Duzee from *Populus* and *Quercus*. Practically all specimens collected by the author were from *Juglans nigra*, where it is commonly found both as nymph and adult.

Subfamily CICADELLINAE.

Tettigoniellidae.

This group as considered at the present time includes those forms which have the ocelli located on the disc of the vertex and the body cylindrical, not dorso-ventrally flattened. We find here a great diversity in head structure, and a considerable difference in wing venation. The species are usually quite large, the antennae are located in a rather deep cavity beneath a prominent ledge formed by the margin of the vertex.

The several species have a great diversity of food plants and feeding habits.

Key to Genera.

1. Ocelli on disc of vertex usually closer posterior than anterior margin, elytra long, covering posterior segments of abdomen. (Fig. 5, 1a.) 2
 Ocelli close to margin of vertex equidistant from apex and eyes, elytra short, apices well rounded, not covering posterior segments of abdomen *Evacanthus*, p. 80
2. Elytra narrow not covering lateral margins of abdominal segments, antennal sockets deep, overhung by a distinct ledge, head and pronotum usually deflexed, sloping. (Fig. 7, 1.) 3
 Elytra broader, covering lateral margins of segments, antennal sockets small, head and pronotum not deflexed, usually in straight line with scutellum and elytral suture. (Fig. 7, 2.) 4
3. Pronotum with posterior margin rounding, with slight median excavation, vertex rather deeply, longitudinally furrowed
Aulacizes, p. 75
 Pronotum broadly roundly emarginate posteriorly, almost parallel with anterior margin, vertex without indication of longitudinal furrow. (Fig. 7, 1.) *Oncometopia*, p. 74
4. Elytra not reticulate veined at apex, head not greatly produced. (Fig. 7, 3.) 5
 Elytra reticulate veined on apical third, head produced, usually longer than pronotum. (Fig. 5, 1; Fig. 7, 4.) *Draeculacephala*, p. 78
5. Vertex flat, margin of vertex sharp, angled with front
Graphocephala, p. 77
 Vertex sloping to front, often conical, not sharp and more rounded to front 6

6. Vertex broad and pointed, reflexed portion of front elevated on disc and with conspicuous arcs. Pronotum more than twice as long as scutellum *Helochara*, p. 77
Vertex more narrowed and bluntly angled, often conical, when reflexed portion occurs it is not elevated. Pronotum not more than twice the length of scutellum 7
7. Vertex subconically narrowed, lateral margins in a continuous line with the outer margins of the eyes *Kolla*, p. 76
Vertex bluntly conical, lateral margins somewhat rounded not in a definite line with the outer margins of the eyes .. *Cicadella*, p. 76

Oncometopia Stål.

Proconia Amyot and Serville.

Head broader than pronotum, vertex rounding to front, obtuse, front gibbous. Pronotum broadly rounded in front, anterior and posterior margins almost parallel. Elytra narrow, lateral margins of abdomen exposed.

Key to Species.

1. Vertex black, irrorate with yellow, size small, 8 mm. 2
Vertex orange with black markings, size large, 12 mm. or more *undata*
2. Elytra red with black nervures *lateralis*
Elytra shining black *lateralis* var. *limbata*

O. undata (Fabricius). *Cicada undata* Fabricius. *Cicada orbona* Fabricius. *Proconia nigricans* Walker. (Fig. 7, 1.)

Ent. Syst., iv, 32, 1794.

Very large, robust, vertex and scutellum orange-yellow, each with a rather definite black color pattern. Pronotum orange-yellow anteriorly, marked with black; posterior portion darker, often slaty blue. Elytra long and narrow, reddish to slaty blue, apices yellowish subhyaline. Face bulbous, orange-yellow. Length 13 mm.

It has been reported for Massachusetts and should be found in Connecticut. Common in old pastures on New England aster.

O. lateralis (Fabricius). *Cercopis lateral* Fabricius. *Cercopis marginella* Fabricius. *Tettigonia striata* Walker.

Ent. Syst., Suppl., 524, 1798.

Shorter and more robust than *undata*. Vertex black, margins of reflexed areas, posterior margin and a few small spots yellow. Pronotum coarsely striate and with numerous large yellow irrorations. Elytra reddish, veins and linear areas, black. Length 7-8 mm.

A very common form in low pastures and waste places on grasses and herbaceous plants.

O. lateralis var. *limbata* (Say). *Tettigonia limbata* Say. *Tettigonia septentrionalis* Walker.

Jour. Acad. Nat. Sci. Phila., iv, 340, 1825.

Similar to preceding in structure, slightly smaller, black, shining, with a few pale irrorations on vertex, pronotum and scutellum,

elytra unmarked. Dorsal surface rather densely and coarsely pitted.

In old pastures and waste places.

Cornwall, 9 Nov., 1919, 25 March, 5 Dec., 1920, 15 Jan., 1921 (K. F. C.).

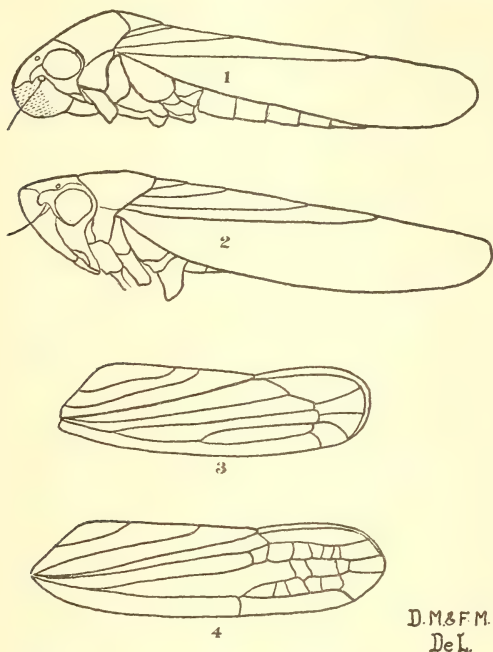


FIG. 7. (1) *Oncometopia undata* Fabricius,—lateral view. (2) *Cicadella gothica* Signoret,—lateral view. (3) *Kolla bifida* Say,—elytron. (4) *Draeculacephala mollipes* Say,—elytron. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

Aulacizes Amyot and Serville.

Tettigonia (Group II) Signoret.

Vertex moderately produced, obtuse, with a large longitudinal furrow, front gibbous, pronotum roundly 6-angular, elytra not covering lateral segments of abdomen.

A. irrorata (Fabricius). *Cicada irrorata* Fabricius. *Cicada nigripennis* Fabricius. *Aulacizes rufiventris* Walker.

Ent. Syst., iv, 33, 1794.

Very large, pale brown to blackish, vertex, pronotum and elytra finely irrorate with pale yellow. Vertex and pronotum very rugose, a deep median furrow and one next either ocellus on vertex. Length 11-12.5 mm.

Occurs in New York and no doubt will be found in Connecticut.

Cicadella Latreille.*Tettigonia* Reaumur.*Tettigoniella* Jacobi.

Head bluntly conical, ledge over antennal pit not prominent. Vertex rounding to front. Elytra covering lateral segments of abdomen, venation not reticulate. No doubt only one species occurs in New England.

C. gothica (Signoret). *Tettigonia gothica* Signoret. *Tettigonia similis* Woodworth. (Fig. 7, 2.)

Ann. Soc. Ent. Fr., Ser. 3, 345, 1854.

Vertex produced but very blunt, pale marked with black or dark brown. Margins of reflexed portions, spot at apex, two longitudinal lines close median line on posterior portion and a somewhat curved one toward each eye, black. Pronotum and elytra variable in color, reddish to grayish green, the latter faintly obliquely striped. Length 5.5-6 mm.

Common on shrubs and undergrowth, in pastures, swampy meadows, and in woodland.

Westville, 19 Sept., 1904 (W. E. B.); New Haven, 26 Feb., 1911 (A. B. C.); 22 Sept., 1918 (F. H. L. and D. M. D.); 20 Aug., 1920; 3 Oct., 1920 (B. H. W.); Hamden, 14 June, 1911 (W. E. B.); 20 June, 1920 (B. H. W.); East Hartford, 16 Sept., 1920, Killingworth, 31 May, 1920 (B. H. W.); Cornwall, 20 June, 1920 (K. F. C.).

Kolla Distant.

Vertex subconically narrowed anteriorly, with lateral margins in a line with outer margins of the eye, vertex foveate near inner margins of eyes. Lateral areas of face strongly, transversely striate.

Key to Species.

1. Vertex short, almost twice as wide as long, elytra green with black stripes *bifida*
Vertex longer, almost as long as basal width, elytra white with dark stripes *tripunctata*

K. bifida (Say). *Tettigonia bifida* Say. *Tettigonia tenella* Walker. (Pl. ii, 2.) (Fig. 7, 3.)

Jour. Acad. Sci. Phila., vi, 313, 1831.

Vertex with two black and two white transverse bands, alternating. Pronotum green with a black band bordered by a white one on anterior and posterior margins, disc green. Elytra green, veins broadly black, tips smoky. Face black. Length 5.5-6 mm.

Common on grasses and low plants throughout the summer, an abundant species in swampy woods, pastures, meadows and along streams. It has also been taken on vines in wooded areas.

Branford, 28 July, 1905 (H. L. V.); Stafford, 23 Aug., 1905 (W. E. B.); New Haven, 3 Oct., 1920, Portland, 25 July, 1920 (B. H. W.); Guilford,

24 July, 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); New Canaan, 26 Aug., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Salisbury, 20 Aug., 1921 (P. G.).

K. tripunctata (Fitch). *Tettigonia tripunctata* Fitch. *Pagaronia tripunctata* Van Duzee. (Pl. ii, 1.)

Homop. N. Y. St. Cab., 55, 1851.

Vertex rather long, conically pointed, white with three black spots, one at apex and one around either ocellus; reflexed arcs brownish. Two transverse lines on disc and posterior margin of pronotum, and elytral nervures brown. Length 5 mm.

Occurs on *Muhlenbergia* and allied grasses, especially in wooded areas during July, August and September. Mr. Van Duzee has placed this species under *Pagaronia* but it seems more closely allied with members of this genus.

Lyme, 20 Aug., 1910 (B. H. W.); New Haven, 22 Sept., 1918 (D. M. D. and F. H. L.); 16 July, 1920 (B. H. W.); Bridgeport, 20 Sept., 1920; Cornwall, 22 Oct., 1920; East Haven, 21 July, 1920; Hamden, 24 July, 1920; Huntington, 9 July, 1920; North Branford, 13 July, 1920 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.); North Haven, 24 Sept., 1921 (B. H. W.).

Helochara Fitch.

Head wider than thorax, broader than long, obtusely angled, reflexed portion of front elevated. Scutellum very short, elytra coriaceous, veins distinct. Apical third of male antennae forming a flat plate.

One species occurs in the United States.

H. communis Fitch.

Homop. N. Y. St. Cab., 56, 1851.

Deep green, vertex and pronotum yellowish; robust, upper surface deeply and closely pitted, reflexed portions of front elevated on vertex. Posterior portion of pronotum convex, scutellum very small. Elytra greenish, heavily pitted, claval suture broadly dark green. Length 4-4.5 mm.

A very common species occurring in swamps and moist places, feeding on grasses and sedges along lakes, streams and lagoons.

Rockville, 24 Aug., 1905 (H. L. V.); Meriden, May, 1913 (H. L. J.); Guilford, 13 July, 1920; Wilton, 19 Oct., 1920; New Haven, 8, 13, 18, 27, 28 July, 1920, 25 March, 1921 (B. H. W.); Cornwall, 28 Nov., 1918 (K. F. C.); 18 July, 1921 (B. H. W.); East Haven, 29 July, 1921 (B. H. W.).

Graphocephala Van Duzee.

Diedrocephala Woodworth.

Head narrower than pronotum, vertex flat, roundly angulate. Pronotum strongly curved in front. Elytra long, coriaceous, venation obscured.

G. coccinea (Foerster). *Cicada coccinea* Foerster. *Tettigonia quadrivittata* Say. *Tettigonia picta* Walker.

Nov. Spec. Ins., 69, 1771.

Vertex yellow to orange, black margined, pronotum reddish, posterior margin with a central tooth and one next either side greenish. Elytra red, costal and sutural margins, a broad stripe along claval suture, and another on disc almost to apex, green or bluish green. Length 8-9 mm.

An abundant and widely distributed form occurring on a number of plants. Especially found on undergrowth in wooded areas. Blackberry apparently is a choice food plant.

New Haven, 18, 27, 28 June, 1902 (E. J. S. M.); 6 Oct., 1902, 23 Oct., 1903, 4 July, 1905, 29 June, 1910 (B. H. W. and H. L. V.); 6 Aug., 1904 (P. L. B.); 3 July, 1913 (L. B. R.); 22 Sept., 3 Oct., 1920 (B. H. W.); Yalesville, 19 Oct., 1903 (H. L. V.); West Haven, 29 June, 1905 (W. E. B.); Portland, 10 July, 1913 (A. E. Moss); Stonington, 2 July, 1914 (I. W. D.); Stratford, 1 Sept., 1920 (B. H. W.); Danbury, 29 Aug., 1920 (B. H. W.); North Branford, 6 July, 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); Greenwich, 24 June, 1921 (W. E. B.); Westport, 24 June, 1921 (W. E. B.); Hamden, 12 July, 1922 (W. E. B.); Stratford, 1 Sept., 1920 (B. H. W.).

G. coccinea var. **teliformis** (Walker). *Tettigonia coccinea* var. *teliformis* Walker.

List. Homop., iii, 764, 1851.

Differs from preceding only slightly in coloration.

Danbury, 29 Aug., 1920 (B. H. W.); Branford, 3, 24 Aug., 1904 (H. W. W.); Durham, 10 Aug., 1922 (M. P. Z.); Easton, 6 July, 1922 (M. P. Z.); Hamden, 12 July, 1922 (W. E. B.); 16 Aug., 1922 (B. H. W.); Kent, 10 Aug., 1918 (B. H. W.); Cornwall, 19 July, 1920 (K. F. C.); North Branford, 5 July, North Haven, 4 Sept., 1921 (B. H. W.).

Draeculacephala Ball.

Vertex usually long and angled, face as seen from side usually straight, front angled with the vertex. Elytra long, greenish, venation distinct, apical and anteapical cells reticulate veined.

The members of this genus are found especially abundant in low swampy land, and feed upon coarse grasses and sedges.

Key to Species.

1. Vertex long, acute, in female decidedly acutely angled 2
Vertex shorter, obtuse, slightly more than right angled 4
2. Vertex one-half longer than pronotum, males usually light beneath, length 7 mm. or more 3
Vertex as long as pronotum, male black beneath; length 6 mm. **minor**
3. Vertex distinctly marked, pronotum with three distinct pale longitudinal lines, length 7 mm. (Fig. 5, 1.) **mollipes**
Vertex poorly marked, pale longitudinal lines on pronotum wanting, length 9-10 mm. **angulifera**
4. Anterior margin of pronotum with vermiculate dark markings, length 7 mm. **inscripta**
Anterior margin of pronotum without vermiculate dark markings, vertex with dark markings, length 8 mm. **noveboracensis**

D. angulifera (Walker). *Tettigonia angulifera* Walker.

List. Homop., iii, 771, 1851.

Vertex slightly shorter than pronotum, broad, yellow with heavy black lines. Spots at apex, median line, lines next eye and reflexed arcs dark in color. Front quite strongly inflated. Length 9-10 mm.

A common form on grasses, river bulrush, in the New England States. It usually is found feeding in low meadows or swamps in moist habitats.

Stafford, 24 Aug., 1905 (W. E. B.).

D. mollipes (Say). *Tettigonia mollipes* Say. *Tettigonia antica* Walker. *Acopsia viridis* Provancher. (Fig. 5, 1; Fig. 7, 4.)

Jour. Acad. Nat. Sci. Phila., vi, 312, 1831.

Vertex longer than pronotum, acutely angled, yellow with fine black lines, often almost uniform yellowish, spots at apex usually distinct. Elytra dark green, nervures conspicuous. Length 6.5-7.5 mm.

The common species of the genus found on numerous grasses and sedges in swamps and uplands.

New Haven, 3 Oct., 1902; 16, 21 Oct., 1903; 20 Aug., 1909 (B. H. W.); 9 Nov., 1903 (H. L. V.); 22 Sept., 1918 (F. H. L. and D. M. D.); 24 May, 3 Oct., 1920 (B. H. W.); Yalesville, 19 Oct., 1903 (H. L. V.); Salisbury, 30 Aug., 1904 (W. E. B.); East River, 10 July, 1909 (C. R. E.); Stamford, 16 Aug., 1912 (W. E. B.); Bridgeport, 20 Sept., 1920; Cornwall, 22 Oct., 1920; Guilford, 13 July, 1920; Orange, 15 Sept., 1920; Portland, 25 July, 1920 (B. H. W.); Cheshire, 10 Aug., 1921 (B. H. W.); East Haven, 29 July, 1921 (B. H. W.); Hamden, 25 Sept., 1921, 28 May, 1922 (B. H. W.); Killingworth, 31 May, 1920 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.); Marlborough, 15 July, 1922 (B. H. W.); Milford, 2 May, 1921 (B. H. W.); North Branford, 1 Aug., 1922 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Wilton, 19 Oct., 1920 (B. H. W.).

D. inscripta Van Duzee.

Ent. News, xxvi, 178, 180, 1915.

Dull green, vertex heavily lined with broad black lines, pronotum a fourth longer than vertex with heavy vermiculate black markings on anterior third. Scutellum with two round black spots and a transverse black dash on disc. Female segment produced, slightly notched at apex. Length 7 mm.

Found on *Muhlenbergia* sp. in swamps and occurs in great numbers as adults during August and September. Has now been found in Tennessee, Ohio, Pennsylvania and New York in addition to Georgia, its type locality.

D. minor (Walker). *Tettigonia minor* Walker. *Diedrocephala producta* Van Duzee.

List. Homop., iii, 772, 1851.

Shorter than *mollipes*, vertex more obtuse, as long as pronotum, with fine black lines. Male black beneath. Length 6 mm.

Resembles *mollipes* very closely, and is often confused with it, being found in similar habitats.

New Haven, 22 Sept., 1918 (F. H. L.); 3 Oct., 1920 (B. H. W.); Wilton, 19 Oct., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Hamden, 25 Sept., 1921 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); East Haven, 29 July, 1921 (B. H. W.).

D. noveboracensis (Fitch). *Aulacizes noveboracensis* Fitch.
Tettigonia prasina Walker.

Homop. N. Y. St. Cab., 56, 1851.

Vertex shorter than basal width, obtuse, a very heavy black spot either side of apex, and somewhat smaller one on margin just before either eye; lines and other markings rather faint. Length 8 mm.

Common in New England in marshy meadows.

Salisbury, 30 Aug., 1904 (W. E. B.); Cheshire, 8 July, 1904 (H. L. V.); Colebrook, 21 July, 1905 (H. L. V.); Hamden, 17 July, 1920; New Haven, 17, 18, 27 July, 1920; North Branford, 13 July, 1920 (B. H. W.); Cornwall, 18 July, 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); Thompson, 19 July, 1921 (B. H. W.).

Evacanthus LePeletier and Serville.

Eucanthus Burmeister.

Vertex very blunt, with a central longitudinal keel, and a branch of this each side from apex to eye. Ocelli just above this keel, close margin and distant from eyes. Front inflated, longitudinally carinate. Elytra short, pubescent above.

E. acuminatus (Fabricius). *Cicada acuminatus* Fabricius.
Cicada interstincta Fallen; *Amblycephalus germari* Curtis;
Amblycephalus orbitalis Fitch.

Ent. Syst., iv, 36, 1794.

A robust species with very blunt head and rather short elytra, not covering abdomen in female. Vertex with median carina and one from apex to either eye. Pronotum short, pubescent. Elytra blackish or dark brown with white stripes. Sparse pubescence along nervures. Length 5.5-6.5 mm.

Occurs sparingly in woodland on low plants. Often found resting on old logs in thick woods.

Subfamily GYPONINAE.

Scarides Amyot and Serville.

To this subfamily belong those forms with the ocelli on the disc of vertex and in which the body is decidedly dorso-ventrally flattened. Usually broad and flat.

Key to Genera.

1. Head more or less flattened but not thin or foliaceous, margin of vertex very narrowly sharp, elytra not perpendicular at tips. (Fig. 5, 2.) 2
- Head flat, foliaceous, margin broadly thin and sharp, elytra angularly pointed, perpendicular at tips **Xerophloea**, p. 84

2. Very short and broad (almost as broad as long), clavus broadly truncate at apex **Penthimia**, p. 81
 Broad elongate, clavus not truncate at apex **Gypona**, p. 81

Penthimia Germar.

Vertex very short and broad, including eyes, narrower than pronotum. Elytra broad, very short, exceeding abdomen in length, appendix broad. Only one species is known in the United States.

P. americana Fitch. *Penthimia vicaria* Walker. *Penthimia picta* Provancher.

Homop. N. Y. St. Cab., 57, 1851.

Resembling a "Cercopid" of the genus *Clastopera*. Black to reddish brown, vertex broadly rounded, transversely striate; pronotum transversely striate. Elytra short, very broad, rather narrowly rounded at apex. Appendix broad. Length 5-6 mm.

Occurs on oak, hickory and other shrubs during early summer.

New Haven, 27 June, 1902 (E. J. S. M.); 21 May, 1910 (A. B. C.); 11 June, 1914 (B. H. W.); 9 June, 1914 (Q. S. L.); Westville, 19 June, 1904 (W. E. B.); Scotland, 27 July, 1904 (B. H. W.); Portland, 5 June, 1914 (M. P. Z.); Stonington, May, 1914 (I. W. D.); Ansonia, 26 May, 1918 (M. P. Z.); Branford, 8, 13 June, 1918 (B. H. W.); Hamden, 18 June, 1919 (M. P. Z.); Middlebury, 20 June, 1916 (M. P. Z.); Milford, 22 June, 1917 (M. P. Z.).

Gypona Germar.

Usually large, body broad and oval. Head broad, rather short, flattened, usually well rounded anteriorly and often margin with a thin edge. Elytra broad, moderately long.

Members of this group commonly feed on grasses, and often are taken from shrubs on which they feed.

The genus has recently been revised by Dr. Ball and although the subgenus names are not used, the synonymy and arrangement has been followed in this treatment.

Key to Species.

- | | |
|--|--------------------|
| 1. Vertex acutely angled with front, margin rather thin and foliaceous | 2 |
| Vertex rounding to front, or with margin thick and not foliaceous | 6 |
| 2. Elytra usually reticulate, some shade of green with few markings | 3 |
| Elytra not reticulate usually brownish or with black markings | 5 |
| 3. Elytra rather smooth, female segment concavely rounding | 4 |
| Elytra strongly rugose, female segment rectangularly emarginate | |
| | rugosa |
| 4. Clavus of elytra usually reticulate, and more or less scarlet coloration upon reticulations. Vertex and pronotum with scarlet stripes | octolineata |
| Clavus of elytra usually not reticulate, no scarlet color on elytra, vertex and pronotum with six orange or yellow stripes ... var. | striata |
| 5. Form broad and rather short, above black shining, or greenish with a black spot on pronotum behind either eye | melanota |
| More elongate, vertex very long, cinereous in color, female segment bisinuate | cinerea |

6. Vertex, pronotum and elytra usually with bright red irrorations, general color brownish *scarlatina*
 Without red markings, elytra yellowish or greenish marked with smoky bands and two round black spots on disc of each
 var. *pectoralis*

G. octolineata (Say). *Tettigonia octolineata* Say.

Jour. Acad. Nat. Sci. Phila., iv, 340, 1824.

Large, oval, green, vertex and pronotum usually with six to eight longitudinal stripes varying from pale yellow to deep red, often broadened to make these appear almost uniform reddish. Vertex broadly rounded, varying somewhat in length. Elytra greenish with a variable venation, many or few cross veins, and variable in color from greenish or pale yellow to deep red. Length 8-10 mm.

This species has been cited under numerous names, but all of these no doubt belong under *octolineata*. Although the structural characters vary greatly, in a long series, no sharp lines of limitation can be given to so-called species under names given below.

It occurs on coarse grasses in meadows, pastures, swamps and practically all moist grassy areas. A very common species which causes great drain to the various grass crops by its constant feeding throughout the summer. It is also found feeding on shrubs and trees, and the egg punctures are frequently found on apple and other twigs. Two rather distinct broods have been noted, an early and late summer brood.

From records it seems to be well distributed in the state.

New Haven, 20 July, 1897 (W. C. Sturgis); 18 June, 1902 (E. J. S. M.); 21 July, 7 Sept., 1910, 28 June, 1911 (W. E. B.); 12 Aug., 1912, "at light"; 27 Aug., 1912 (H. B. K.); Branford, 21 July, 1905 (H. W. W.); Westville, 9 Sept., 1907 (W. E. B.); Wallingford, 3 Aug., 1910 (D. J. C.); Portland, 20 July, 8, 9, 15 Aug., 1913 (B. H. W.); East River, 6 Aug., 1910 (C. R. E.).

G. octolineata var. *octolineata* Say.

This variety is usually distinguished by heavier reticulation of the elytra. Also with scarlet stripes on vertex and pronotum and reticulations of elytra often washed with scarlet.

New Haven, 6 Oct., 1902, 22 Sept., 3 Oct., 1920 (B. H. W.); South Glastonbury, 12 Oct., 1905 (B. H. W.); Ellington, 25 Sept., 1920 (B. H. W.).

G. octolineata var. *striata* Burmeister. *G. cana* Burmeister. *G. flavilineata* Fitch. *G. quebecensis* Provancher. *G. scrupulosus* Spangberg. *G. olivacea* Spangberg. *G. geminata* Osborn.

A rather bright greenish yellow form with six yellowish stripes on vertex and pronotum. The venation is somewhat variable but usually the reticulations are confined to the apical part of the wings. Female segment rounded. Length 10 mm.

New Haven, 14 July, 1909 (B. H. W.).

G. rugosa Spangberg. *G. ramosa* Kirkaldy. *G. delicata* Fowler.
Spec. Gyponae, 6, 1878.

Large green species with vertex, pronotum and elytra rugose, venation very conspicuous. Some specimens have black spots on pronotum. Female segment deeply rectangularly notched. Length 10-11 mm.

Superficially it resembles *octolineata* but is coriaceous on upper surface and is known to feed on burr and white oak.

Hartford, 27 July, 1914 (W. A. Muirhead).

G. melanota Spangberg. *G. bipunctulata* Woodworth. *G. nigra* Woodworth. *G. bimaculata* Gibson. *G. unicolor* Gibson.

Spec. Gyponae, 19, 1878.

Broad and short. Color of sexes differing. Female pale green, often with a pair of round black spots on pronotum back of the eyes, and a second pair on the hinges. Male varying from green to black. Vertex, pronotum and scutellum usually shining black, elytra smoky, the black markings of abdomen showing through. Female segment nearly truncate, male plates broad and short. Length 8 mm.

According to Ball there are five color varieties of the male which have been described as distinct species. The species is grass-feeding and found in meadow, pasture and prairie situations.

New Haven, 9 Aug., 1906 (P. L. B.); 14 Aug., 1906 (W. E. B.); 31 July, 22 Aug., 1920 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); Guilford, 24 July, 1921 (B. H. W.); Cornwall, 17 July, 1921 (B. H. W.).

G. cinerea Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., iii, 460, 1877.

Gray to brown, vertex produced but not acutely angled. Entire dorsal surface often finely and rather sparsely irrorate with brown. In pale specimens nervures of elytra margined with irrorations. Elytra grayish opaque. Length 9 mm.

Although Dr. Ball states that probably all eastern references should be *miliaris*, after examining Connecticut material and comparing it with Iowa and Dakota material it seems advisable to place it under this name. Also since *negotiosa* Gibson is placed as a synonym of *miliaris* and the specimens at hand do not agree with Gibson's paratypes. This is apparently a grass-feeding species.

Recorded from Connecticut (Van Duzee Catalogue), also specimens examined from Hamden, 5 July, 1920 (P. G.).

G. scarlatina Fitch var. *scarlatina* Fitch. *G. modesta* Spangberg.

Homop. N. Y. St. Cab., 57, 1851.

Pale yellow to brown with vertex, pronotum and elytra usually flecked with red. Elytra frequently with reddish nervures and sparsely spotted, a number of irregular darker spots on disc. Length 9-10 mm.

This species has been taken from undergrowth in wooded areas.

G. scarlatina var. *pectoralis* Spangberg. *G. hullensis* Provancher.
G. bimaculata Woodworth. *G. woodworthi* Van Duzee.
 (Fig. 5, 2, a, b.)

Spec. Gyponae, 46, 1878.

Dull greenish shading to brown. An indefinite smoky band arising on posterior margin of pronotum and extending to apex of elytra, costal margins yellowish. Usually four black spots, often very small on elytra. Vertex and pronotum pale, often a pair of pale spots behind eyes on vertex. Length 8-9 mm.

Common in the eastern part of United States on trees and shrubs. According to Ball it occurs on water sprouts and lower limbs of Basswood.

New Haven, 18 June, 1902 (E. J. S. M.); 8 Aug., 1920 (B. H. W.); North Branford, 16 June, 1922 (B. H. W.).

Xerophloea Germar.

Mesodicus Fieber.

Parapholis Uhler.

Wedge-shaped in appearance. Vertex broad, flat, anterior margin thin. Elytra long, angularly pointed and perpendicular at tips. Dorsal surface coarsely and rather densely pitted.

These species live in dry habitats and are more abundant in arid regions. They are common on the prairie grasses of the west, and are found in dry, restricted areas in the south and eastern United States.

Key to Species.

1. Vertex with margin broadly rounded, length less than 7 mm. . . *viridis*
 Vertex with margin more angulate, size large, more than 7 mm. *major*

X. viridis (Fabricius). *Cercopis viridis* Fabricius. *X. grisea* Germar. *X. virescens* Stål. *Parapholis peltata* Uhler.

Ent. Syst., iv, 50, 1794.

Vertex broadly rounded and flattened, often with shallow longitudinal depressions. Greenish to dirty yellow, often a median stripe on vertex and posterior portion of pronotum dark brown. Vertex, pronotum and scutellum deeply and heavily pitted. Elytra perpendicular at apices, clavus and costal areas pitted, otherwise hyaline, nervures distinct. Length 6-7 mm.

Often found in dry upland grassy areas, and occurs on *Aristida gracilis* society. A widely distributed form.

X. major Baker.

Psyche, viii, 285, 1898.

General appearance of *viridis*, but larger with vertex more angulate and more strongly produced. Dorsal surface pitted as in preceding. Bright green to dull yellow often marked with brown. Elytra hyaline on central and apical portion. Length 7-8 mm.

Found in same habitat as preceding.

New Haven, 5 July, 1920 (B. H. W.).

Subfamily JASSINAE.

Jassides.

The great number of leafhoppers with the ocelli located on the margin of the vertex where such is definite or on that portion of the head between the vertex and front when there is no perceptible limit to either, are included in this family.

Key to Tribes.

1. Elytral nervures branching on the disc, ocelli on or near margin of vertex. (Fig. 8, 6.) 2
Elytral nervures not branching on the disc, branched at base, ocelli often wanting. (Fig. 8, 5.) **Typhlocybini**, p. 147
2. Ocelli on vertex near margin, or between vertex and front, and remote from the eyes. (Fig. 8, 3.) **Acucephalini**, p. 85
Ocelli on margin between vertex and front, usually very close to eyes. (Fig. 8, 2.) **Jassini**, p. 89

Tribe ACUCEPHALINI.

Vertex and face distinctly separated, generally by a well-defined margin, the ocelli on or adjoining margin, or margin being absent, on rounded portion between front and vertex. Appendix very narrow or wanting.

Key to Genera.

1. Vertex rather flat with acute edge forming definite limitations of vertex and front. (Fig. 8, 4.) 2
Vertex sloping and rounding to front, without definite margin. (Fig. 8, 3.) 3
2. Vertex transversely striate in front, elytra narrowly rounded at apex **Stroggylocephalus**, p. 85
Vertex not transversely striate in front, more broadly rounded at apex. (Fig. 8, 4.) **Acucephalus**, p. 86
3. Pronotum gently rounded, not produced to anterior margin of eyes, vertex moderately long, well rounded. (Fig. 8, 3a, b.) .. **Xestocephalus**, p. 87
Pronotum strongly rounded, produced almost half its length beyond anterior margin of eyes. Head very short, acutely conical. (Fig. 8, 1.) **Nionia**, p. 89

Stroggylocephalus Flor.

Vertex produced, obtusely angled, transversely striate in front. Margin thin, foliaceous, ocelli close to front margin. Elytra coriaceous, narrowly rounded at apex, appendix wanting.

S. agrestis (Fallen). *Cicada agrestis* Fallen. *Tettigonia mixta* Say.

Acta Holm, xxvii, 23, 1806.

Grayish yellow to brown, frons black finely irrorate with pale brown. Vertex striate in front, smooth at base. Pronotum transversely striate, brownish. Elytra with inner margins, bars and

spots along nervures, and costa with twelve or more spots, brown or black. Female paler with few markings. Last ventral segment concave, notched at middle. Length 6-7 mm.

Occurs in moist grassy areas.

New Haven, 13 May, 1911, 25 March, 1921 (B. H. W.).

Acucephalus Germar.

Aphrodes Curtis.

Pholetaera Zetterstedt.

Anoscopus Kirschbaum.

Vertex obtusely angular, produced, in female generally tricarinate. Ocelli on front margin a little nearer the eyes than the apex.

Key to Species.

1. Larger, 6.5 mm. in length, vertex thin at edge, disc rather concave, pronotum exceeding vertex in length **nervosus**
2. Smaller, not exceeding 6 mm. in length, vertex with edge thickened, disc scarcely depressed, vertex as long as pronotum
albifrons

A. nervosus (Schrank). *Cicada nervosus* Schrank. *Cercopis rustica* Fabricius. *Cercopis striata* Fabricius. (Fig. 8, 4.)

Enum. Ins. Aust., 252, 1781.

A rather broad flat-headed species varying in color from greenish to brown. A yellow transverse band is conspicuous on pronotum of male. Females usually light, speckled with brown. Length 5-6 mm.

Common on grasses in New England, and often collected with the *Cercopidae* which it resembles in general appearance.

New Haven, 11 July, 1920 (B. H. W.).

A. albifrons (Linnaeus). *Cicada albifrons* Linnaeus. *Acucephalus circumflexus* Provancher.

Syst. Nat., Edn. 10, i, 437, 1758.

A smaller form than *nervosus*, variable in color, yellowish to brown, males with white spots on elytra often in the form of large blotches or transverse bands. Elytra shortened in males usually exposing tip of abdomen. Front pale. Length 3-4 mm.

A common species on low grasses. This species is now known to live partially under the ground or in little depressions around the roots of grasses. It is single brooded, the adults being found in late July, August and September.

Hamden, 24 July, 1910; New Haven, 30 July, 1909, 23 July, 1910 (B. H. W.); 16 July, 31 July, 1920 (B. H. W.); Branford, 21 July, 1920, East Haven, 21 July, 1920 (B. H. W.); Guilford, 26 July, 1920 (M. P. Z.); Cornwall, 18 July, 1921 (B. H. W.); North Branford, 5 July, 1921 (P. G.).

Xestocephalus Van Duzee.

Small ovate, head subconical, narrower than pronotum, vertex sloping. Ocelli just above anterior edge and distant from the eyes. Elytra somewhat rugose, without appendix, and with five apical areoles.

The species of the genus feed on grasses and sedges and are usually found only in swampy or very moist places.

Key to Species.

1. Color brown, elytra brownish, usually with dark markings 2
 Color black, vertex often a uniform dark brown, face distinctly black, elytra with pale spots at the apex, length 3 to 3.5 mm. .. **nigrifrons**
2. Vertex uniformly brown, unmarked or with faint brownish markings 3
 Vertex brown with inscribed yellow markings, pronotum and elytra dark with conspicuous pale spots **pulicarius**
3. Species large, 3.5 mm., vertex and pronotum rather uniform brownish, elytra mottled **superbus**
 Species smaller, 2 mm. in length, entire insect a pale brown color, seldom marked with spots **brunneus**

X. pulicarius Van Duzee. (Fig. 8, 3.)

Bull. Buff. Soc. Nat. Sci., v, 197, 215, 1894.

Small, yellowish to brown, vertex with heavy brown vermiculate markings. Pronotum brown with numerous pale blotches. Scutellum brown. Elytra yellowish hyaline with nervures and mottling brown, leaving round pale areas. Length 2.5-3 mm.

Occurs in New England on *Carex*, and is abundant in swampy or moist and sometimes dry meadows, July to September.

New Haven, 27 July, 3 Aug., 1920 (B. H. W.).

X. superbis (Provancher). *Deltocephalus superbis* Provancher.

X. fulvocapitatus Van Duzee.

Pet. Faune Ent. Can., iii, 339, 1890.

Rather large, vertex uniform pale brown, pronotum often darker, slightly mottled with pale. Elytra yellowish hyaline, marked with rather large brownish areas, apices broadly brown, veins pale, indistinct. Length 3 mm.

Feeds on *Carex* and should occur in swamp habitats in Connecticut.

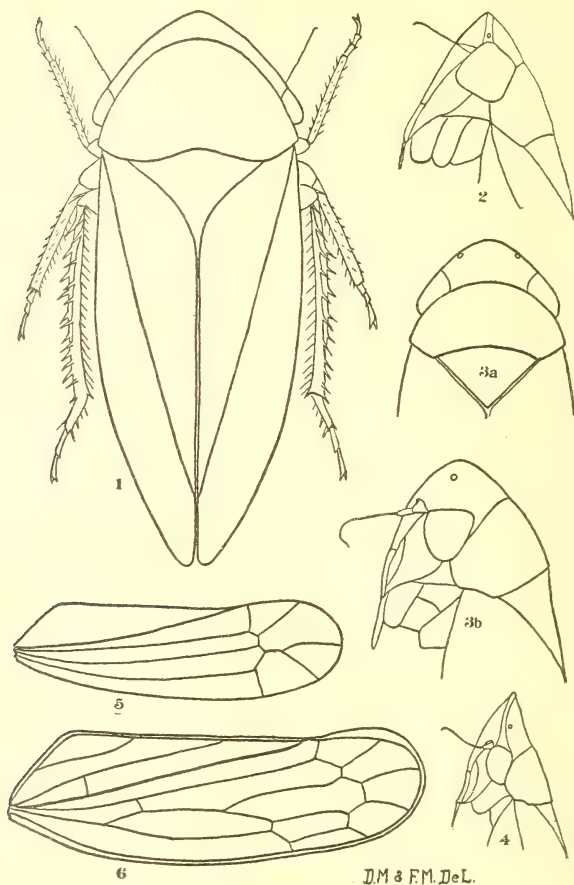
New Haven, 27 July, 1920 (B. H. W.).

X. nigrifrons Osborn.

Me. Agr. Expt. Sta., Bull. 238, 109, 1915.

Size of *superbus*, vertex, pronotum, scutellum and face black shining or often very dark brown, unmarked. Elytra black shining, opaque, with very few pale areas, when present occurring only on apical portion. Length 3 mm.

Described from Maine and known to occur in Tennessee and Pennsylvania. Taken in low marshy places and undoubtedly has a food plant similar to allied species.



J.M. & F.M. DeL.

FIG. 8. (1) *Nionia palmeri* Van Duzee,—dorsal view. (2) *Scaphoideus auronitens* Provancher,—head, lateral view. (3a) *Xestocephalus pulicarius* Van Duzee,—head, dorsal view; (3b) same, lateral view. (4) *Acucephalus nervosus* Schrank,—head, lateral view. (5) *Empoa querci* Fitch,—elytron. (6) *Euscelis parallelus* Van Duzee,—elytron. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

X. brunneus Van Duzee.

Bull. Buff. Soc. Nat. Sci., viii, 62, 1907.

A very minute brown species with few pale markings. Face, vertex, pronotum and scutellum uniform pale brown unmarked, elytra brownish hyaline, appearing darker over abdomen, marked with two rather faint paler bands just back of clavus. Length 2 mm.

Reported from Massachusetts and Rhode Island, and perhaps is widely distributed throughout New England on *Carex* and small sedges.

Nionia Ball.*Goniagnathus* Van Duzee.

Vertex short, apex obtusely angled. Ocelli on anterior margin distant from eyes. Anterior margin of pronotum produced beyond anterior margin of eyes.

N. palmeri (Van Duzee). *Goniagnathus palmeri* Van Duzee. (Fig. 8, 1.)

Can. Ent., xxiii, 171, 1891.

Short, robust, head conically pointed, anterior margin of pronotum extending beyond anterior margin of eyes. Black shining, resembling a *Macropsis* in general appearance. Length 4 mm.

Perhaps occurs on grasses in Connecticut, usually quite common in old pastures and waste places on herbaceous plants.

North Branford, 2 June, 1921, 23 May, 2-5 June, 1 Aug., 1922 (B. H. W.); 5 July, 1921 (P. G.).

Tribe JASSINI.

Jassidae.

Ocelli on margin of vertex usually very close to eyes.

Key to Genera.

1. Vertex produced, anterior edge sharp, often flattened, thin and foliaceous. (Fig. 9, 3.) 2
Vertex often produced, acutely angled or rounded but margin not thin or foliaceous. (Fig. 9, 11b, and 13a.) 5
2. Elytra narrowed posteriorly to pointed tips, general color brownish *Dorydiella*, p. 91
Elytra not narrowed posteriorly, apices well rounded, general color greenish 3
3. Elytra with two claval veins. (Fig. 9, 7.) 4
Elytra with one claval vein. (Fig. 9, 2.) *Spangbergiella*, p. 93
4. Vertex greatly longer than basal width between eyes, thin and foliaceous, usually with color markings, elytra very short, greatly exceeded in female by abdomen and ovipositor. (Fig. 9, 3.) *Hecalus*, p. 91
Vertex broader between eyes than length at middle, without color markings, elytra longer, covering or only slightly exceeded by abdomen. (Fig. 4.) *Parabolocratus*, p. 93
5. Inner sector of elytra twice forked, three anteapical cells formed. (Fig. 9, 5 and 7.) 6
Inner sector of elytra not forked, only two anteapical cells. (Fig. 9, 8, 9 and 10.) 22
6. Vertex as long as or almost as long as width between the eyes, disc flat or furrowed, and a rather distinct margin between vertex and front. (Fig. 9, 11.) 7
Vertex usually greatly wider than long, in most cases with disc sloping and margin rounding to front. (Fig. 9, 12 and Fig. 10, 14.) 12
7. Elytra with two cross nervures between first and second sectors or with supernumerary veinlets to costa or both. (Fig. 9, 7.) .. 8
Elytra with one cross nervure between first and second sectors (occasionally with two in *Thamnotettix*). (Fig. 9, 5, and Fig. 10, 5.) 19

8. Vertex not strongly produced, often angled, face broader proportionately. (Fig. 11, 1, 2, 3.) 9
Vertex strongly produced and acutely angled, front very long and narrow. (Fig. 9, 13a, b.) **Platymetopius**, p. 100
9. Elytra usually with many supernumerary veinlets along costal margin **Mesamia**, p. 94
Elytra with reflexed veinlets at apex of costal area but without supernumerary veinlets along costal margin. (Fig. 11, 5.) **Deltocephalus**, p. 104
10. Elytra without costal recurved veins. (Fig. 10, 4 and 5.) 11
Elytra with recurved veins on costal margin. (Fig. 9, 5.) **Scaphoideus**, p. 95
11. Elytra marked with fine brown ramose pigment lines **Phlepsius**, p. 125
Elytra usually subhyaline, without ramose pigment lines or areas, often with bright color markings **Thamnotettix**, p. 133
12. Inner branch of first sector forking on disc of corium. (Fig. 10, 9 and 2.) 13
Inner branch of first sector not forking on disc of corium. (Fig. 10, 8.) 20
13. Elytra greatly narrowed and acutely pointed at apex. (Fig. 9, 6.) **Acinopterus**, p. 133
Elytra scarcely narrowed, broad and rounded at apex. (Fig. 9, 7 and 10.) 14
14. Elytra short, not exceeding abdomen, often very short, covering only basal portion, head short and broad. (Fig. 10, 1.) 15
Elytra longer exceeding abdomen in length 17
15. Head broad, ovipositor short, elytra usually extending to ovipositor. (Fig. 10, 6.) **Euscelis**, p. 117
Head narrower, ovipositor long, elytra usually extending only to second abdominal segment 16
16. Vertex bluntly rounded, almost parallel margined, female abdomen abruptly narrowed posteriorly, ovipositor only a little longer than abdomen **Driotura**, p. 117
Vertex more conical, bluntly but decidedly produced at middle, female abdomen gradually narrowed, last visible dorsal segment very long, ovipositor extremely long **Aconura**, p. 116
17. Elytra with one cross nervure between first and second sectors (Fig. 10, 3.) 18
Elytra with two cross nervures between first and second sectors .. **[Aligia]**
18. Elytra marked with ramose pigment lines 19
Elytra without markings in the form of ramose pigment lines 20
19. Ramose lines on elytra in the form of bands or saddle areas, pigmentation of various colors **Eutettix**, p. 122
Ramoses lines on elytra not restricted to bands, often quite uniformly inscribed, some shade of brown **Phlepsius**, p. 125
20. Pronotum with sides short, usually with dark or bright markings **Thamnotettix**, p. 133
Pronotum with sides longer, usually a uniform green or greenish yellow, vertex broadly rounded or roundly angulate **Chlorotettix**, p. 138
21. Vertex angularly, conically produced, eyes small, quite remote. (Fig. 10, 14.) 22
Vertex broadly curved, parallel margined, eyes large, close together, almost as long as pronotum. (Fig. 10, 15.) .. **Jassus**, p. 141
22. Clypeus not tuberculate, elytra rather short and broad. (Fig. 10, 14.) **Neocoelidia**, p. 142
Clypeus strongly and conspicuously tuberculate, elytra longer and narrower **Paracoelidea**, p. 142

23. Head narrower than pronotum which is somewhat angularly produced between the eyes. (Fig. 10, 11.) *Balclutha*, p. 145
 Head as wide as or wider than pronotum, anterior margin of which is well rounded and but slightly produced. (Fig. 10, 12 and 13.) 24
24. Head slightly produced, usually with definite color markings. (Fig. 10, 13.) *Cicadula*, p. 142
 Head very blunt, not produced, parallel margined, without definite color markings. (Fig. 10, 12.) *Eugnathodus*, p. 146

Dorydiella Baker.

Head broader and longer than pronotum, anterior margin roundly angulate, foliaceous and upturned, ocelli on margin close to eyes. Elytra long, with apices acutely angled. Four apical cells and two anteapical. Clavus with two longitudinal veins. Only one species is known to belong to this genus.

D. floridana Baker.

Can. Ent., xxix, 159, 1897.

Large, yellowish with brown markings. Vertex long, broad and flat with margin foliaceous, upturned in front. Elytra long, apices acutely angled. Face somewhat irrorate, vertex with five dark spots on anterior edge. Pronotum longitudinally striate. Elytra with ramose pigment lines mostly longitudinal, apex with brown spot. Length 8 mm.

Although rather difficult to collect, it occurs in abundance during late August and early September at the margins of lagoons on the young *Scleria-Eleocharis* growth which follows the receding water-line as evaporation takes place.

In general appearance and color markings this species resembles quite closely species of *Phlepsius* and the pointed elytra would suggest a relationship to *Acinopterus*. The head character, however, is more closely allied to the *Dorycephalus* type and this is more pronounced in the nymphs than in the adults. It is, therefore, given this relative position, since the nymphal characters are most important.

Hecalus Stål.

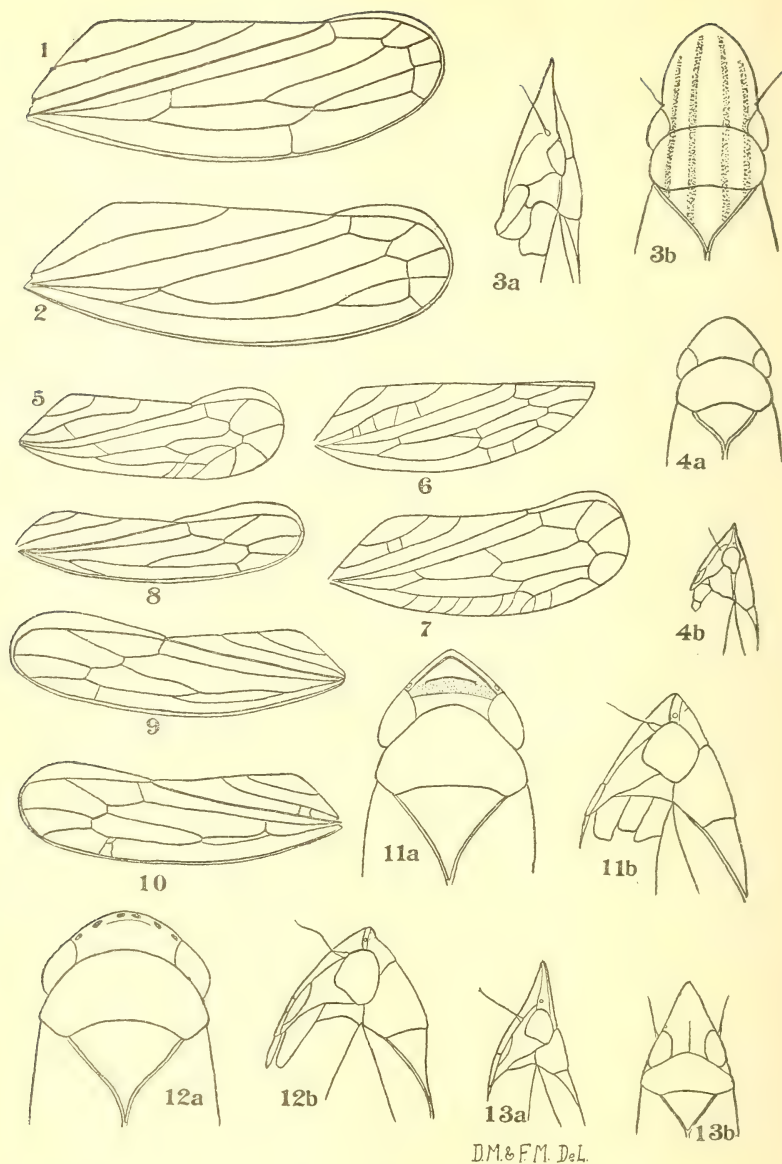
Glossocratus Fieber.

Vertex longer than basal width and flattened, sharp and foliaceous at margin. Pronotum very short and broad. Clavus of elytra with at least two veins. Elytra shorter than abdomen.

H. lineatus (Uhler). *Glossocratus lineatus* Uhler. *Glossocratus fenestratus* (male) Uhler. (Fig. 9, 3a, b.)

Bull. U. S. Geol. Geog. Surv. Terr., iii, 463, 1877.

Greenish with very long thin flat vertex. Four longitudinal red stripes extending across vertex and pronotum and central two across scutellum. Elytra short in female, greatly exceeded by abdomen, nervures broadly reddish or yellowish, in male exceeded by black abdomen, and crossed by two broad black bands, one



DM. & FM. DeL.

FIG. 9. (1) *Parabolocratrus flavidus* Signoret,—elytron. (2) *Spangbergiella mexicana* Baker,—elytron. (3a) *Hecalus lineatus* Uhler,—head, lateral view; (3b) same, dorsal view. (4a) *Parabolocratrus viridis* Uhler,—head, dorsal view; (4b) same, lateral view. (5) *Scaphoideus immistus* Say,—elytron. (6) *Acinopterus acuminatus* Van Duzee,—elytron. (7) *Platymetopius frontalis* Van Duzee,—elytron. (8) *Eugnathodus abdominalis* Van Duzee,—elytron. (9) *Balclutha impicta* Van Duzee,—elytron. (10) *Cicadula sexnotata* Fallen,—elytron. (11a) *Scaphoideus auronitens* Provancher,—head, dorsal view; (11b) same, lateral view. (12a) *Eutettix johnsoni* Van Duzee,—head, dorsal view; (12b) same, lateral view. (13a) *Platymetopius cuprescens* Osborn,—head, dorsal view; (13b) same, lateral view. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

across middle and another covering apical and a part of antepical cells. Length, male 7 mm., female 9 mm.

A rather rare form, occurring on sedges, around swamps and lagoons. Has been found in New York and Massachusetts.

Spangbergiella Signoret.

Head strongly produced before the eyes, flat, ocelli on sharp margin near eyes. Pronotum twice wider than long, elytra with four apical cells. Clavus with one vein.

S. vulnerata (Uhler). *Glossocratus vulnerata* Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., iii, 464, 1877.

Long and slender, green with two oblique red lines on vertex and two on pronotum, and a median one on posterior portion of pronotum. Elytra with veins yellowish. Length, female 8 mm., male 5.5 mm.

This southern form has worked northward along the coast and has been taken in New Jersey and New York, so may occur in Connecticut on low vegetation.

Parabolocratus Fieber.

Closely allied to two preceding genera, vertex roundingly produced, flat and thin. Clavus with two veins, elytra with four sharp apical cells.

These species are closely allied in structural characters and general appearance and are found in similar habitats usually in moist or swampy areas on rank grasses.

Key to Species.

1. Rather small, 6 mm., head flattened and well rounded, usually with ovipositor conspicuous, extending just beyond elytra as viewed from above **viridis**
Larger, females 7.5-8 mm. males 6 mm., vertex more broadly rounded and margin drawn out into a thin edge, elytra shorter **major**

P. viridis (Uhler). *Glossocratus viridis* Uhler. (Fig. 9, 4a, b.)

Bull. U. S. Geol. Geog. Surv. Terr., iii, 462, 1877.

Green or yellow unmarked, head broad, flat, well rounded before, elytra short not covering ovipositor, often brownish at apices. Length 6 mm.

A very common form in damp rank grassy places in early summer. Professor Osborn reports this species as feeding on *Stipa spartea*. It is a very abundant form often in moist pastures, in swamps and swamp meadows, on the coarse grasses and sedges.

New Haven, 11 Aug., 1908 (B. H. W.); 22 Aug., 1920, 15 May, 1921 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.).

P. major Osborn.

Me. Agr. Expt. Sta., Bull. 238, 110, 1915.

Similar to *viridis* in form and color, but larger with vertex well rounded, margin drawn out to thin edge and elytra proportionately shorter. Length, male 6 mm., female 8 mm.

A northern form which should occur in same habitats and in company with *viridis*. Described from specimens taken from *Calamagrostis canadensis* both in adult and nymphal stages.

New Haven, 11 Aug., 1908 (B. H. W.); 22 Aug., 1920, 12 May, 1921 (B. H. W.); East Haven, 27 June, 1921 (M. P. Z.).

Mesamia Ball.*Paramesus* Van Duzee.

Vertex with anterior margin usually elevated and acutely angled with front, disc depressed. Elytra with second cross nervure present and central anteapical cell slightly constricted. Supernumerary veinlets along clavus and costa.

Key to Species.

1. Elytra whitish marked with a dark saddle between the cross nervures **nigradorsum**
Elytra fulvous with milky white areas **vitellina**

M. nigradorsum Ball. *Paramesus twiningi* Van Duzee. *Paramesus jucundus* Gillette and Baker. (Pl. iii, 8.)

Proc. Dav. Acad. Sci., xii, 60, 1907.

Ivory white, vertex with disc brown, a black spot either side of median line anteriorly. Pronotum brown, an irregular row of spots behind anterior margin, face black, elytra milky white. Saddle on posterior two-thirds of clavus black, a band on basal and apical portions and nervures, brown. Length 4.5 mm.

Reported as feeding on *Helianthus*, a common and widely distributed species perhaps extending as far north as Connecticut.

M. vitellina (Fitch). *Acocephalus vitellina* Fitch. *Jassus twiningi* Uhler. *Paramesus furcatus* Osborn.

Homop. N. Y. St. Cab., 57, 1851.

Vertex and face yellow, often a black line below margin. Anterior margin of pronotum yellowish, darker posteriorly, elytra orange-yellow with numerous white spots, an oblique testaceous band extending from middle of costa to apex of clavus. Length 5.5-6.5 mm.

Common throughout New England feeding on wild rose, and often found on tall grasses in wooded areas.

East River, 2 Aug., 1910 (C. R. E.); North Branford, 13 July, 1920 (B. H. W.); Portland, 8 Aug., 1913, 25 July, 1920 (B. H. W.); New Haven, 4 July, 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Ellington, 8 Aug., 1922 (B. H. W.).

Scaphoideus Uhler.

Vertex flat, angularly produced, almost as long as basal width. Elytra rather long, covering abdomen. Costa often with recurved veins.

Key to Species.

1. Elytra usually mottled with irregular patterns, not with cruciate brown mark, nervures dark 2
Milky white in color, elytra with a brown cruciate mark, darker margined, crossing elytra **cruciatus**
2. Vertex unicolorous or marked with brownish, but not with broad transverse fuscous band between eyes 3
Vertex marked with a distinct transverse rather broad red or fuscous band between eyes. (Fig 9, II.) 8
3. Vertex with faint or definite brown markings, or blotched with fuscous next eyes 4
Vertex uniform brown, without dark lines or stripes **unicolor**
4. Vertex not blotched with fuscous next eyes, pale or with dark markings 5
Vertex orange or blotched with fuscous next either eye, but without a band, elytra orange with white spots **jucundus**
5. Vertex with brown lines forming a V-shaped mark back of apex and a pale band across base 6
Vertex whitish without markings, or with faint indication of a transverse brown line between eyes 7
6. Size larger, 6 mm., vertex brownish, V-shaped mark at apex not touching a heavy brown mark at its base, and not enclosing a white spot. Elytra with commissural lobate areas rather obscure **consors**
Size smaller, 5.5 mm., vertex much paler, V-shaped mark contingent at base with a heavy transverse bar, enclosing a white triangular spot. Elytra with nervures dark and commissural lobate areas conspicuous **scalaris**
7. Vertex, pronotum and scutellum whitish, vertex often with a faint transverse band, pronotum and scutellum usually with very few and faint markings **intricatus**
Vertex yellowish with wavy transverse lines, pronotum distinctly marked with brown blotches, elytra very dark but with scutellar margin and two distinct spots along claval suture milky white **lobatus**
8. Band between eyes without large toothed portion extending forward 9
Transverse band between eyes with a rather large central toothed portion extending forward 11
9. Transverse band duller in color not margined with black 10
Transverse band bright orange-red, margined before with a black line at central portion. (Fig. 9, IIa.) **auronitens**
10. Elytra uniform dark brown on posterior two-thirds, veins obscure, pale areas wanting, female segment distinctly and rather deeply, broadly notched **luteolus**
Elytra grayish, pale with brown nervures and with dark brown and milky white areas. Female segment produced, not notched at center **opalinus**
11. Darker, usually brownish or grayish, band on vertex darker, brownish, transverse behind, with a toothed projection added on anterior side 12
Light ochraceous, band on vertex rather broad, orange, waved by median anterior projecting tooth, not transverse behind ... **ochraceus**
12. Female segment often produced, but not toothed at center, vertex with transverse band dull reddish 13

- Female segment usually produced with a definite tooth at center, band on vertex broad, very dark brown or blackish, rather robust, about 6-6.5 mm. 14
13. Vertex pointedly angled, usually about as long as width between eyes, face rather pale with black arcs, elytra brownish **immistus**
Vertex more bluntly and obtusely angled, usually about two-thirds as long on middle as width between eyes, face black with pale arcs, elytra very dark brown appearing blackish **melanotus**
14. Length 6 mm., female segment with a small median tooth on posterior margin **productus**
Slightly larger 6.5 mm., female segment bearing a distinct median carina and tooth **carinatus**

S. cruciatus Osborn.

Ohio Nat., xi, 253, 1910.

Ivory white or yellowish, vertex with two transverse brown spots before middle. Front with two arcs at base, a bar below antennae, and a broader one across clypeus and lower portion of lorae. Elytra with a cruciate brown mark bordered with darker brown. Anteapical cells and first and second apicals dark. Length 4.5 mm.

Described from Long Island, and no doubt occurs in Connecticut. A rather rare species occurring throughout the summer.

S. auronitens Provancher. *Jassus areatus* Harris (MS). (Fig. 9, 11a, b.)

Pet. Faune Ent. Can., iii, 277, 1889.

Pale brown, iridescent, vertex with a rather broad transverse orange-red band, anteriorly margined with black between the eyes. A black band on margin and another just above margin. Pronotum marked with reddish. Elytra with three recurved costal veins, and three pairs of black spots along claval suture. Length 6 mm.

A common form on undergrowth in wooded areas, especially in open woods where it was swept from *Solidago*.

East River, 5 Aug., 1908 (C. R. E.); New Haven, 20 Aug., 1909 (B. H. W.); 22 Sept., 1918 (F. H. L.); 22 Aug., 13 Sept., 3 Oct., 1920 (B. H. W.); Portland, 12 Aug., 1913 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.); Cromwell, 30 Aug., 1920 (B. H. W.); Hamden, 6 Aug., 1922, 25 Sept., 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

S. jucundus Uhler.

Trans. Md. Acad. Sci., i, 34, 1889.

Bright orange fulvous, vertex, pronotum and elytra with milky white spots. Disc of vertex reddish, a dark line above margin. Elytra with veins and costal reflexed nervures broadly fuscous. Length 5-6 mm.

Often found on oak shrubs during July, August and September.

Plainville, 2 Sept., 1921 (B. H. W.); Hamden, 25 Sept., 1921 (B. H. W.).

S. unicolor Osborn.

Jour. Cinn. Soc. Nat. Hist., xix, 196, 1900.

Rather broad, robust, almost uniform dark brown in color, with few markings. Vertex and elytra uniform brown. Elytra brown-

ish subhyaline, nervures dark, reflexed costal veins and apex broadly fuscous. Length 5 mm.

Occurs in small numbers on herbaceous plants during June, July and August.

Branford, 28 July, 1905 (H. L. V.); New Haven, 1 Aug., 1920, 4 July, 1921 (B. H. W.); Hamden, 11 Aug., 1921 (B. H. W.).

S. consors Uhler.

Trans. Md. Acad. Sci., i, 36, 1889.

Vertex brownish with similar markings to *scalaris*, but they are not so distinct and blended more nearly with the color of the vertex. Pronotum with a paler spot behind either eye and a median longitudinal line. Ocelli large, pale. Elytra brownish, subhyaline, with only a suggestion of the pale spots on claval suture, nervures brown, apical margin and costal veinlets broadly black. Length 5.5-6 mm.

In wooded areas and waste places during July and August on herbaceous plants.

East River, 12 Aug., 1910 (C. R. E.); New Haven, 8 Aug., 1920 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.); Portland, 24 July, 1921 (B. H. W.).

S. scalaris Van Duzee.

Ent. Amer., vi, 51, 1890.

Resembling *consors* but easily distinguished from it by smaller size and a light mark on elytral suture, formed by three white spots along margin. Vertex with a fulvous spot next each eye, a marginal line, two behind margin not quite meeting on median line, a short strongly curved one just behind and joining these two, and a median longitudinal line on posterior half, black. Length 5 mm.

In some places this is an abundant pasture and meadow species and occurs also on herbaceous plants in woodland from June to September. It is perhaps rather rare in Connecticut, and occurs in August and September.

S. lobatus Van Duzee. (Pl. ii, 7.)

Bull. Buff. Soc. Nat. Sci., v, 199, 211, 1894.

Vertex yellowish or whitish with a line above and parallel to margin, and a transverse line between eyes enlarged to a spot on disc, brown. Pronotum mottled with brown. Elytra milky white, nervures broadly brown or black and numerous heavy and large blackish blotches or inscribed lines. The portions of elytra along scutellum and claval suture white with three rather definite white lobes along commissural line. Length 6 mm.

In open woods this species is quite common on *Solidago caesia*, and perhaps other herbaceous plants, but great numbers have been collected the past season from this plant during August and September.

New Haven, 22 Sept., 1918 (F. H. L.); Norwalk, 8 Sept., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Hamden, 18 July, 6 Aug., 1922 (B. H. W.).

S. ochraceus Osborn.

Proc. Ia. Acad. Sci., v, 242, 1898.

Vertex whitish or yellowish, well produced, a brown band just above margin, a transverse ochraceous band before eyes with a tooth extending forward at center. Pronotum ochraceous, scutellum paler. Elytra tawny ochraceous, subhyaline, nervures and spots along claval suture brown. Face pale with two lines and faint arcs on basal portion. Length 5-6 mm.

Taken in open woods on dry sandy areas from tall grasses, the predominating species of which was *Andropogon furcatus*. It may not feed on this grass but occurs in this association during July and August.

Portland, 24 July, 1921 (B. H. W.).

S. productus Osborn.

Jour. Cinn. Soc. Nat. Hist., xix, 200, 1900.

Closely resembling *immistus* in coloration, longer and with heavier markings. Vertex rather blunt, a brown line above margin interrupted at middle and a broad fuscous transverse band between eyes, with a large central median toothed spot extending forward. Pronotum dark reddish brown. Elytra brownish hyaline with costal nervures broadly brown, a dark brown spot along claval suture slightly back of scutellum and a brown blotch behind cross nervure of first and second sectors. Female segment produced and black at middle. Length 5.5-6 mm.

A common woodland species which seems to prefer moist habitats.

East River, 14, 23 July, 1908 (C. R. E.); New Haven, 8 July, 1912, "at light," 1 Aug., 1920 (B. H. W.); East Haven, 21 July, 1920 (B. H. W.); (Willow) New Haven, 9 July, 1921 (B. H. W.); 28 July, 1920 (B. H. W.).

S. carinatus Osborn.

Jour. Cinn. Soc. Nat. Hist., xix, 201, 1900.

Larger than *productus* but very similar in coloration. Gray with dark cross band on vertex, elytral markings dark brown, more intensified than in preceding. Female segment strongly carinate and with projecting tooth at center. Length 6.5 mm.

A species occurring in open woodland on a mixed growth of herbaceous plants during July and August.

New Haven, 14 July, 1920 (B. H. W.); Portland, 20 July, 1913, 25 July, 1920 (B. H. W.); 10 July, 1913 (A. E. Moss).

S. intricatus Uhler.

Trans. Md. Acad. Sci., i, 34, 1889.

Vertex, pronotum and scutellum ivory white with a few faint markings, a marginal line and transverse band on vertex, spots on pronotum and base of scutellum, fuscous. Elytra pale, nervures brown, irregular yellowish to testaceous spots, a very large one near base, and three conspicuous milky white lobate spots along claval suture. Length 5.5-6.5 mm.

Occurs on weeds and herbaceous plants in low, sheltered, usually wooded areas. It often is taken in goodly numbers in a *Solidago* association, and may feed upon this plant.

Darien, 5 Aug., 1909 (C. W. J.).

S. luteolus Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 210, 1894.

Vertex whitish, a distinct black line a little back of margin and a very broad transverse fuscous band between eyes. Pronotum dark, a paler transverse area on disc. Elytra rather uniform brownish without pale areas, nervures on posterior half, a few spots, and apex, broadly dark brown. Female segment long, roundly produced with a broad, deep V-shaped notch. Length 5 mm.

A rather rare species feeding apparently on herbaceous plants in shaded areas.

New Haven, 7 Sept., 1910 (A. B. C.); 16, 29, 31 July, 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.).

S. immistus (Say). *Jassus immistus* Say. (Fig. 9, 5.)

Jour. Acad. Nat. Sci. Phila., vi, 306, 1831.

Whitish to grayish yellow, vertex with marginal line and transverse band with tooth at center. Pronotum dark with a transverse and longitudinal white area. Elytra grayish yellow, veins broadly brown, apices dark, two spots along claval suture and a few others milky white. Length 4.5-6 mm.

The most common of the group apparently, and feeding on a variety of plants. Taken in pasture land and on shrubs. Certain of the smaller ones known as varieties have been found on willows, and others occur abundantly on grasses.

East River, 14 July, 8 Aug., 1908, 3 Aug., 1910 (C. R. E.); Lyme, 20 Aug., 1910 (B. H. W.); Portland, 10 July, 1913 (A. E. Moss); 20 July, 1910, Aug., 1913 (B. H. W.); New Haven, 31 July, 3 Aug., 1920 (B. H. W.), on willow; Hamden, 24 July, 1920 (B. H. W.), on poplar; New Canaan, 3 Sept., 1920; Cornwall, 18 July, 1921 (B. H. W.); Kent, 10 Aug., 1918 (B. H. W.).

S. melanotus Osborn.

Jour. Cinn. Soc. Nat. Hist., xix, 206, 1900.

Vertex obtusely angled, pale buff, a faint marginal brown line just above apex. Band between eyes dull reddish and rather narrow. Pronotum black at side, the entire central portion from vertex to scutellum pale, often whitish. Scutellum pale buff, basal angles black. Elytra dark brownish, nervures and spotted areas black with few and rather vague light markings. Face, lorae, genae and pectus black, white arcs on base of face. Legs pale. Female last ventral segment produced and notched at middle. Length 5 mm.

Usually found in meadows and waste places; the food plant is unknown at the present time.

Woodbury, 16 July, 1913 (W. E. B.); Hamden, 25 Sept., 1921 (B. H. W.).

S. opalinus Osborn.

Rept. N. Y. St. Ent., xx, 525, 1905.

Gray, paler than *immistus*, vertex pale with faint markings. Pronotum pale brown, apex of scutellum yellowish. Elytra grayish to pale brown, nervures brown, some broadly darker, claval veins ending in dark spots along suture, between which are formed two large sutural spots and three just outside of claval vein, white, opalescent.

Found under field conditions often in similar habitats with *immistus*.

Platymetopius Burmeister.*Proceps* Mulsant and Rey.

Vertex long, pointed, front very narrow, elytra with two cross veins between the sectors and several small costal veinlets. The elytron contains five apical and three anteapical cells.

Both in structure and food habits these resemble the species of *Deltocephalus*, but are not found to occur on grasses in such abundance. Most of the species feed on herbaceous or low vegetation, and are often found only in boggy or moist habitats.

Key to Species.

1. Elytra usually with inscribed pigmentation, costal veinlets present 2
Elytra whitish hyaline, crossed by three distinct transverse fuscous
vittae, costal veinlets absent **hyalinus**
2. Face light or yellowish, often dark margined 3
Face dark or brownish, 5 mm. in length, with a broken pale, trans-
verse band before the eyes **magdalensis**
3. Markings on vertex in the form of lineations usually with a pale
median line on vertex. Color brownish or fulvous 4
Markings on the vertex in the form of transverse vittae, color
black, face yellow, dark margined **frontalis**
4. Face yellowish, dark margined, distinctly angled above and with
angular white line on base distinct 5
Face without dark margin, bluntly angled at base, angular white
line very faintly showing 6
5. Vertex not quite twice as long as width between the eyes, general
color cinereous **acutus**
Vertex more pointed, about two and one-half times as long as
width between the eyes, color bright cuprescent **cuprescens**
6. Length 3-4 mm.; light in color with greenish tint, valve of male
almost rounded at apex **angustatus**
Length 4.5-5 mm., darker, fulvous, valve of male distinctly angled
..... **fulvus**

P. hyalinus Osborn.

Ent. News, xi, 501, 1900.

Whitish or yellowish hyaline, elytra crossed by three narrow, transverse brown bands, one each across middle and apex of clavus, and another just before apical cells. Vertex well angled a half longer than width between eyes, rather uniform yellowish. Length 4.5 mm.

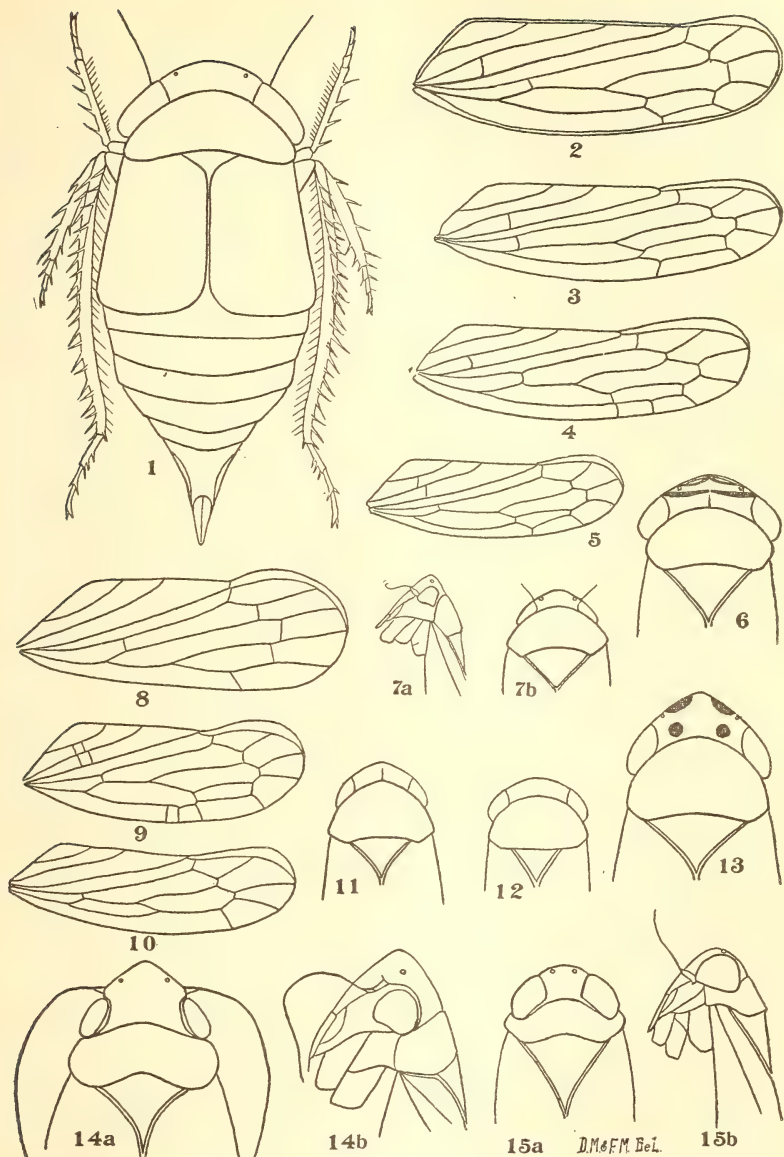


FIG. 10. (1) *Driotura gammaroides* Van Duzee,—dorsal view. (2) *Euscelis parallelus* Van Duzee,—elytron. (3) *Chlorotettix unicolor* Fitch,—elytron. (4) *Thamnotettix fitchii* Van Duzee,—elytron. (5) *Phlepsius irroratus* Say,—elytron. (6) *Euscelis striolus* Fallen,—head, dorsal view. (7a) *Acinopterus acuminatus* Van Duzee,—head, lateral view; (7b) same, dorsal view. (8) *Jassus olitorius* Say,—elytron. (9) *Eutettix seminudus* Say,—elytron. (10) *Cicadula variata* Fallen,—elytron. (11) *Balclutha impicta* Van Duzee,—head, dorsal view. (12) *Eugnathodus abdominalis* Van Duzee,—head, dorsal view. (13) *Cicadula variata* Fallen,—head, dorsal view. (14a) *Neocoelidia tumidifrons* Gillette and Baker,—head, dorsal view; (14b) same, lateral view. (15a) *Jassus olitorius* Say,—head, dorsal view; (15b) same, lateral view. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

Apparently an imported species occurring on Japanese and sugar maples, and perhaps other species of the same group. Quite abundant both as nymphs and adults in June and July. They seem to be more abundant on the higher branches and only a few occur on the lower foliage of the same tree.

New Haven, 21 Sept., 1910 (W. E. B.); 4, 5, Aug., 1920 (B. H. W.); Cromwell, 27 Aug., 1920 (B. H. W.).

P. acutus (Say). *Jassus acutus* Say. (Pl. ii, 3.)

Jour. Acad. Nat. Sci., Phila., vi, 306, 1831.

Brown, vertex acutely angled, almost twice as long as width between eyes, marked with longitudinal pale areas. Pronotum with longitudinal vittae, elytra with numerous dark costal veinlets and apical areoles. Face yellow, fuscous margined. Length 5 mm.

A very common species throughout the summer on grasses in meadows and pastures, and frequently abundant on blueberry in boggy areas. It is of economic importance because of its numbers and variety of food plants.

Yalesville, 19 Oct., 1903, New Haven, 21 Oct., 1903 (H. L. V.); Sept., 1918 (D. M. D., F. H. L.); 14, 20 June, 20 July, 1920 (B. H. W.); Branford, 31 July, 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); Orange, 15 Sept., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); North Branford, 12 June, 1921 (B. H. W.); North Haven, 24 Sept., 1921 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.).

P. cuprescens Osborn. (Fig. 9, 13a, b.)

Rept. N. Y. St. Ent., xx, 517, 1905.

Vertex long, sharp, more than twice longer than wide between eyes, side margins often paler in color, cuprescent, elytra heavily infuscated, with few areolar spots, most of which are on apical and anteapical cells. Face pale, very slightly and gradually darkened at margin. Length 4.5-5 mm.

A common form in shaded and wooded areas, occurring on ferns and undergrowth in a moist habitat. June to September.

P. angustatus Osborn.

Rept. N. Y. St. Ent., xx, 518, 1905.

Vertex almost one-half longer than width between eyes, greenish with longitudinal dark markings. Elytra greenish with yellowish tinge; costa hyaline with dark veinlets, areolar spots confined to apical and anteapical cells. Veins on apical portion heavily infuscated. Length 4 mm.

Described from Long Island, N. Y., and no doubt its distribution extends northward and into Connecticut. It often occurs in the brake-fern habitat in open fields or cut-over areas during August, and is a distinctly northern species.

P. fulvus Osborn.

Rept. N. Y. St. Ent., xx, 519, 1905.

Vertex rather short and blunt, a little longer than width between

eyes, yellowish with three pale areas at apex, and often brownish vermiculate markings. Bright fulvous, elytra opaque, with few pale areolar spots, all located at apex, costal nervures dark brown. Face yellowish not darkened at sides. Length 4.5-5 mm.

Occurs on shrubs and blueberry. Described from Oyster Bay, N. Y., and its range of distribution is quite large, including a part of New England.

New Haven, 22 Sept., 1918 (F. H. L.); 31 July, 5 Aug., 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.); Portland, 24 July, 1921 (B. H. W.).

P. frontalis Van Duzee. (Fig. 9, 7.)

Can. Ent., xxii, 112, 1890.

Vertex short and blunt, almost one-half longer than basal width, a rather indefinite light transverse vitta before eyes. Pronotum with distinct longitudinal white vittae, elytra heavily inscribed with black and with numerous large white oval spots. Face yellow heavily infuscated at sides. Length 3.5-4 mm.

A common species in damp meadows and a pest of grasses and herbaceous plants. It often occurs with other species of the genus in boggy areas. Abundant throughout the summer.

New Haven, 6 July, 1904 (P. L. B.); 4, 8, 11, 20, 31 July, 3 Oct., 1920 (B. H. W.); West Haven, 27 June, 1905; Rockville, 23 Aug., 1905 (H. L. V.); Hamden, 30 June, 1913 (B. H. W.); 20 June, 1920 (B. H. W.); Branford, 21 July, 1920 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.); Orange, 15 Sept., 1920 (B. H. W.); Westbrook, 21 Sept., 1920 (B. H. W.); Killingworth, 27 June, 1920 (W. E. B.).

***P. frontalis** var. **nigrifrons** DeLong, n. var.

Resembles *frontalis* but with vertex a little more bluntly angled.

Color: Uniform black with few pale markings. Face, clypeus and lorae shining black, margin of vertex and the V-shaped line just beneath, white. Vertex with a spot either side of apex and another just back of this, white. Elytra uniform black marked only by two small areolar spots along claval suture, four on base of apical and three on apex of anteapical cells, white.

Genitalia: Male valve and plates as in *frontalis*.

A single male specimen collected at West Rock, New Haven, September 22, 1918, by the author and specimens collected at New Haven, 9 July, 1921 (B. H. W.) are at hand, and seem after careful study to be a varietal form because of the unique coloration and shining black face.

P. magdalenensis Provancher. *P. obscurus* Osborn.

Pet. Faune Ent. Can., iii, 275, 1889.

Resembling *acutus* in size and form, vertex rather blunt, less than twice as long as width between eyes, marked with irregular pale transverse vittae. Pronotum with longitudinal vittae, elytra brownish, inscribed and irrorate with dark brown, and with numerous white areolar spots. Face brown, irrorate with white. Length 5 mm.

A common form in New England, often occurring in boggy places on blueberry during August and September.

New Haven, 22 Sept., 1918 (F. H. L.); 16, 20 June, 20 July, 22 Sept., 1920 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.); Hamden, 23 Oct., 1921 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.).

Deltocephalus Burmeister.

Vertex more or less obtusely triangular, often strongly produced, head, including eyes, wider than pronotum. As a rule there are two distinct cross veins between the first and second sectors.

At the present time this genus contains a great number of American species which vary greatly in structural characters, and are consequently very hard to characterize as a group.

A large number of the most injurious forms of the entire family belong to this genus and feed usually upon grasses, cereal and forage crops. Especially abundant in meadows, old pastures and fields of grain.

Though commonly double-brooded, some species have only one generation each season. Field observations and collecting records seem to indicate that in a few species a partial second generation may occur.

Key to Species.

1. Elytra with two outer apical veinlets reflexed to costa, these together with the previous one pale, dark margined. Appendix wanting. (Fig. 11, 5.) 2
Elytra without reflexed apical veinlets, appendix present although often very small 5
2. Vertex produced, decidedly longer than width between eyes, definitely marked with black or dark fuscous. (Fig. 11, 1.) 3
Vertex as wide as long, yellowish hyaline with few dark markings *inflatus*
3. Elytra with pale nervures, rather broadly and heavily margined with dark fuscous 4
Color bright yellow, nervures somewhat indistinct, a large round black spot on disc of each elytron, almost filling discal cell, and reflexed veins broadly margined with fuscous *areolatus*
4. Head very strongly produced but rounded at tip, female segment with rounded median lobe, male plates long and with pointed divergent tips *sandersi*
Form appearing more robust, vertex broader and shorter, female segment with a central produced, somewhat keeled portion, male plates shorter than combined width, tips bluntly rounded *pictus*
5. Elytra with outer clavus often with one, but seldom with two, reticulate veins; vertex usually rather long, disc flat. (Fig. 11, 3d.) 6
Elytra with outer clavus strongly reticulate, with two, and usually several, reticulate veins; vertex short, disc convex, apex blunt. (Fig. 11, 4b.) 9
6. Elytra with only a suggestion of an appendix, pronotum short with posterior angles broadly rounded 7
Elytra with distinct appendix, usually large, pronotum proportionately longer, posterior angles more prominent 15

7. Small, not exceeding 3.5 mm., elytra marked with dark brown, vertex longer than broad 8
 Broader, robust, length exceeding 4 mm., vertex as broad as long, without many dark markings. (Fig. 4, 1.) **configuratus**
8. A dark brown band across elytra and apical cells brown, female segment concavely rounded **sayi**
 Elytra paler without dark bands, female segment convexly produced **misellus**
9. Size small, not exceeding 3.5 mm., elytra short, spots on vertex small, usually four or none 10
 Size larger, 4 mm., a pair of large black spots on vertex, pronotum and scutellum **inimicus**
10. Some shade of gray or brown with elytra dark or with dark markings 11
 Pale yellow to olive, a pair of triangular spots at apex formed by areas on the face and a broken band between the eyes, black **vinnulus**
11. Grayish or brownish with pale and dark areas 12
 Reddish brown, vertex and anterior portion of pronotum yellowish, apices of elytra whitish hyaline **apicatus**
12. Long, 3 mm. or more, elytra usually decidedly longer than abdomen 13
 Very short, compact, not exceeding 2.75 mm. in length, elytra short, usually not longer than abdomen **compactus**
13. Vertex as long as or longer than width between eyes, rather strongly angled 14
 Vertex wider between eyes than length at middle, more obtusely angled. (Fig. II, 2.) **obtectus**
14. Female segment concaved posteriorly, male plates broad, bluntly pointed. (Fig. II, 3a.) **weedi**
 Slightly longer and more robust, female segment produced with visible side plates, male plates long with acutely pointed tips .. **interruptus**
15. Vertex usually bluntly angled or almost rounded anteriorly, width between eyes greater than length at middle 16
 Vertex as long as or longer at middle than width between eyes, usually rather sharply angled. (Fig. II, 4a.) 17
16. Color greenish or yellowish with fuscous or black markings 23
 Color black or dark brown; spots at apex of vertex, and costal margin broadly yellow **flavicosta**
17. Size small, less than 3 mm., yellowish green without definite markings 18
 Larger, more than 3 mm. in length, usually 3.5 mm., or more 19
18. Vertex distinctly longer than width between eyes, angularly pointed; female segment with shallow, broad but abrupt excavation, male plates almost truncated **melsheimerii**
 Vertex less pointed, almost as wide between eyes as length at middle, female segment narrowly incised at middle; male plate convexly rounded, tips bluntly pointed but not truncated **minus**
19. Vertex sharply angled, sides extending in a straight line from eye to apex, margin without definite markings. (Fig. II, 4a.) 20
 Vertex broadly roundly angled, sides of vertex convexly rounded to apex, a heavy black line between eyes on margin, often forming two black points on vertex at apex. (Fig. II, 6a.) ... **pascuellus**
20. Slender, female segment not incised, male plates with apices more pointed 21
 More robust, female segment produced, rather deeply incised at middle, male plates rather broad and blunt at tips **debilis**
21. Female segment distinctly produced at middle 22
 Female segment sinuated, with three small lobes at middle; male plates tapered to narrow attenuated tips **nominatus**

22. Female segment with median third abruptly produced and truncated; male plates with tips quite broad, bluntly pointed and divergent *sylvestris*
 Female segment with median half gradually produced to a pointed brownish tooth; male plates tapered to narrowly rounded tips .. *acus*
23. Form narrow, vertex scarcely one-third wider than long, pronotum not twice wider than long, central anteapical cell seldom divided by cross vein 24
 Form broader vertex one-third wider than long, pronotum more than twice as wide as long. As a rule the middle anteapical cell is constricted and divided by a cross vein 27
24. Vertex not marked with black spots above margin 25
 Vertex with a row of four to six black spots above margin, face with dark arcs *balli*
25. Color yellowish green, wings visible through subhyaline elytra ... 26
 Color greenish often marked with black areas, face sometimes entirely black, elytra opaque, never subhyaline *abdominalis*
26. Female segment concavely rounded posteriorly, male plates slightly exceeding valve, blunt at tips *striatus*
 Female segment triangularly produced from base, with median tooth at apex, male valve transverse, plates short but acutely pointed *littoralis*
27. Vertex rather strongly angled, four black triangular spots above margin, elytra greenish, unmarked *simplex*
 Vertex more obtusely angled with two or four black spots above margin; yellowish, elytra with veins margined with fuscous .. *osborni*

D. areolatus Ball. (Fig. 11, 1.) (Pl. iii, 1.)

Can. Ent., xxxi, 188, 1899.

Vertex one-third longer than width between eyes, acutely angled, bright yellow with a curved black spot either side at apex. Face usually entirely black. Elytra yellow, opaque, a large black spot on disc and reflexed veins at apex broadly black. Venation rather obscured except at apex where they are narrowly margined with brown. Female segment strongly excavated with a rounded median tooth. Length 3-3.5 mm.

Occurs as a rule in dry, hot, often sandy areas on *Panicum*, as adults during early summer and late fall. It has been found in the sandy and coastal areas of New Jersey and undoubtedly is distributed farther northward along the coast.

D. inflatus Osborn and Ball.

Proc. Ia. Acad. Sci., iv, 202, 1897.

One of the broad-headed members of the *reflexus* group. Vertex as wide between eyes as length at middle, rather broadly angled. Yellowish with a few fuscous markings. Basal half of face fuscous. Elytra usually flaring at tips, third apical cell black and reflexed, nervures usually dark margined. Female segment emarginate with a rather broad produced central tooth notched at middle, a black spot either side. Length 4.25-4.75 mm.

A common pasture and meadow form feeding on grasses in low areas and along swamp margins. Specimens are at hand from Long Island, N. Y., and it occurs no doubt in Connecticut.

D. sandersi Osborn.

Proc. Dav. Acad. Sci., x, 164, 1907.

Vertex strongly produced, tip rounded, one-fourth longer than basal width between eyes, more than one-half longer than pronotum. A pair of heavy black paranthesis spots enclosing tip and an interrupted band before eyes, brownish. Pronotum with longitudinal bands. Elytra buff, nervures whitish, heavily bordered with fuscous. Face variable in color from entirely black to pale on lower portion. Female segment with a central rounded lobe, black margined. Male valve triangular, rather short and broad, plates twice longer, tips pointed and divergent. Length 3-3.5 mm.

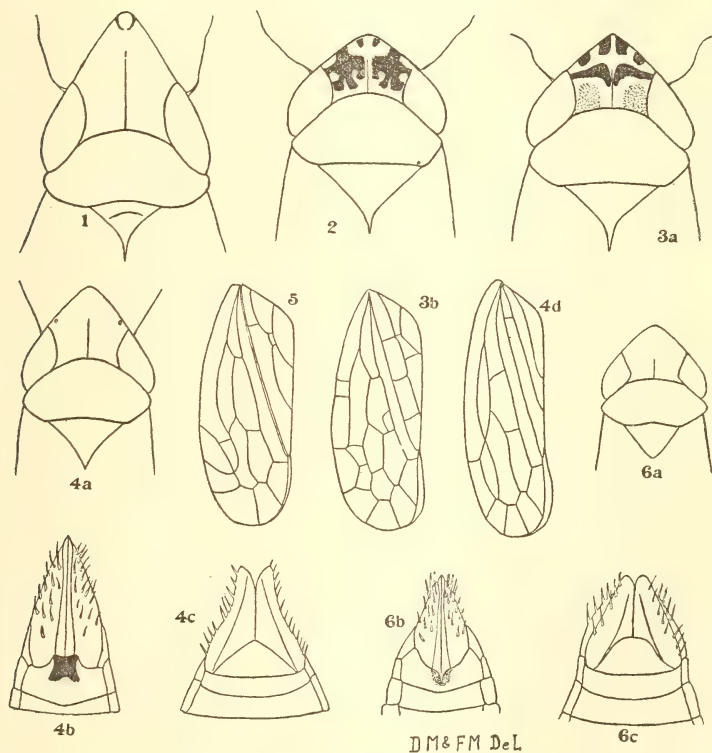


FIG. 11. (1) *Deltoccephalus areolatus* Ball,—head, dorsal view. (2) *Deltoccephalus obtectus* Osborn and Ball,—head, dorsal view. (3a) *Deltoccephalus weedi* Van Duzee,—head, dorsal view; (3b) same, elytron. (4a) *Deltoccephalus sylvestris* Osborn and Ball,—head, dorsal view; (4b) same, female genitalia; (4c) same, male genitalia; (4d) same, elytron. (5) *Deltoccephalus pictus* Osborn,—elytron. (6a) *Deltoccephalus pascuellus* Fallen,—head, dorsal view; (6b) same, female genitalia; (6c) same, male genitalia. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

A grass-feeding species common in the eastern and southern states.

New Haven, 7, 8, 11, 20 July, 1920 (B. H. W.).

D. pictus Osborn. (Fig. 11, 5.)

Proc. Dav. Acad. Sci., x, 165, 1907.

Allied to *D. reflexus*, vertex produced, acutely angled, a little longer on middle than width between eyes. Pronotum with four broad longitudinal dark stripes. Basal half of face black. Elytra whitish, veins pale, broadly dark margined. Female segment slightly concave, a rounded short median tooth with a black line either side. Male plates rather long and narrowed to rounded tips. Length 3.5 mm.

Common throughout the summer on grasses of the *Aristida* type in New York and Pennsylvania. It is perhaps more widely distributed.

New Haven, 30 Oct., 1920 (B. H. W.).

D. configuratus Uhler. (Fig. 4, 1, 2, 3, 4.) (Pl. iii, 4.)

Bull. U. S. Geol. Geog. Surv. Terr., iv, 511, 1879.

Vertex broader between eyes than median length, bluntly angled, a distinct white cross on the disc in well-marked specimens. Pronotum pale with longitudinal dark stripes. Elytra with veins white, often dark margined and spotted with fuscous. Female segment medially produced in a long attenuated bifid black process, male plates long, obliquely truncate. Length 4.5-5 mm.

A very common species on grasses in pastures, meadows and swampy areas throughout New England during July, August and September.

New Haven, 1 June, 1911 (B. H. W.); 10 June, 1920 (B. H. W.); 4 July, 1920, 21 May, 16 July, 1921 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); Portland, 25 July, 1920 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.).

D. sayi (Fitch). *Amblycephalus sayi* Fitch. (Pl. iii, 2.)

Homop. N. Y. St. Cab., 61, 1851.

Rather short, vertex rather strongly angled, tip, two concentric bands and a median longitudinal stripe pale, forming dark reddish brown spots between them. Pronotum brownish with pale longitudinal stripes. Elytra short and broad at apex, often not exceeding abdomen, brownish, veins white, a dark band across middle and another across apex of elytra. Female segment broadly concavely rounded. Male plates rather long and tapered to blunt tips. Length 3.5 mm.

A very abundant meadow species of economic importance throughout the northern states from May to October. It often feeds on the tall grasses and is able to live under a variety of conditions.

New Haven, 31 Oct., 1903 (H. L. V.); 20 Aug., 1909, 26 June, 1910, 30 May, 1911 (B. H. W.); 22 Sept., 1918 (F. H. L.); 28 June, 11, 18 July,

1920 (B. H. W.); West Haven, 27 June, 1905 (H. L. V.); Bridgeport, 20 Sept., 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); East Haven, 10 May, 1921 (B. H. W.); Hamden, 5 July, 1920 (P. G.); Orange, 22 June, 1920 (B. H. W.); North Branford, 5 July, 1921 (P. G.); Killingworth, 27 June, 1920 (W. E. B.).

D. misellus Ball.

Can. Ent., xxxi, 191, 1899.

Resembling *sayi* in general appearance but smaller and paler without the dark bands, and the female segment roundly produced. White markings on vertex not conspicuous, elytra short with veins white, often discal, claval and apical cells more or less black. Male plates shorter and broader than *sayi*. Length 3.2 mm.

A typical and apparently restricted northern form, found in sufficient abundance usually in New England to place it with those of economic value. Common on grasses during June, July and August.

D. weedi Van Duzee. (Fig. 11, 3a, b.)

Trans. Am. Ent. Soc., xix, 306, 1892.

Pale brown with white and fuscous markings. Vertex produced, as long as wide between eyes, well angled, a dark interrupted band just before eyes and four black triangular spots behind margin. Elytra with nervures broadly white, margined with fuscous. Clavus strongly reticulate. Female segment concavely rounded. Male valve broadly rounded, plates angularly produced. Length 3 mm.

Feeds on low pasture grasses and frequents waste places. It is a rather common form over a large area, including the New England States, June to September.

Huntington, 9 July, 1920 (B. H. W.).

D. interruptus DeLong.

Tenn. St. Bd. Ent., Bull. 17, 51, 1916.

Resembling *weedi* in coloration but more robust. Vertex distinctly angled, a little longer on middle than width between eyes, as long as pronotum, elytra broad but slightly exceeding abdomen. Quite variable in coloration. In dark specimens an interrupted band on vertex between eyes and four round black spots above margin often fused with band. Elytra with nervures pale, dark margined. Female last ventral segment very short at sides, convexly produced on middle to three times length of preceding segment, a membraneous plate conspicuous at either side. Male valve almost transverse, slightly produced at middle and placed in concavity of last ventral segment. Plates one-half longer than valve concavely narrowed to acutely pointed tips. Length 2.9-3.2 mm.

Originally described from Tennessee, but has been collected in many states throughout the eastern United States, and the record

for Connecticut is perhaps the most northern. It occurs on grasses in moist places, often along stream margins.

New Haven, 11 July, 1920, 2 July, 1922 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.).

D. compactus Osborn and Ball.

Proc. Ia. Acad. Sci., iv, 217, 1897.

Very short and broad, vertex broader than long, elytra scarcely exceeding abdomen, in the female surpassed by the ovipositor. Vertex marked with a transverse interrupted band between eyes and four black points, often pale, just above margin. Elytral cells margined with fuscous. Clavus reticulate veined. Female segment deeply concavely excavated, concealed except at lateral angles by a convexly rounding membrane. Male plates broad at base narrowed to pointed attenuated tips. Length 2.25 mm.

Found in company with *obtectus* on short grasses in high, well-drained pastures from June to September.

D. obtectus Osborn and Ball. (Fig. 11, 2.) (Pl. iii, 3.)

Proc. Dav. Acad. Sci., vii, 78, 1898.

Resembling *compactus* but longer, elytra considerably surpassing abdomen. Vertex broader than long with interrupted dark band before eyes and four small black spots behind margin. Spots behind eyes on pronotum and basal angles of scutellum black. Elytra pale, conspicuous dark margins and spots on cells black or dark brown. Female segment concavely excavated, almost concealed by median membrane roundly produced with a shallow notch either side of small median tooth. Length 3 mm.

Reported from Massachusetts and feeds in rather high pastures on short grasses. It seems to prefer this dry habitat where the land is well drained, and is common in a *Danthonia* association from June throughout the summer.

New Haven, 11, 31 July, 22 Sept., 1920 (B. H. W.); Guilford, 31 July, 1920 (B. H. W.).

D. vinnulus Crumb.

Ann. Ent. Soc. Amer., viii, 192, 1915.

In form resembling *weedi*, vertex bluntly angled, about as long on middle as basal width between the eyes. Elytra rather broad, outer clavus with very few reticulate veins. Vertex pale yellow, black markings from front extending on to vertex and forming a triangular spot on either side of apex, and a broken black band extending transversely across between anterior margins of eyes forms a white cross on anterior portion. Elytra olive, subhyaline, veins whitish, sometimes narrowly fuscous margined. Face black above with pale arcs. Female last ventral segment with lateral margins strongly emarginate from the base, lateral angles rounded to posterior margin which is bisinuate forming three lobes, the central one the smallest. Lateral membranes are present. Male valve triangular, plates twice longer than valve.

concavely narrowed and produced to gradually tapering acutely angled apices.

This species has a rather wide distribution in the eastern United States. It occurs in abundance on *Andropogon virginicus* in upland and prairie areas. The record for Connecticut is a good one.

Madison, 24 Sept., 1922 (B. H. W.).

D. apicatus Osborn.

Can. Ent., xxxii, 285, 1900.

Small, robust, vertex almost as long as width between eyes, yellowish, unmarked. Pronotum yellowish anteriorly, shading to brown posteriorly. Scutellum brown. Elytra exceeding abdomen, chestnut brown, tips whitish hyaline, venation pale. Female segment concavely excavated, covered at the middle with a membrane which is convexly produced and has a brown spot either side of central tip so as to appear as having three points. Length 3 mm.

Occurs on *Panicum* during July and August. A common form in wet pastures and on margins of lagoons or other bodies of water. It has also been taken in rather dry habitats in large numbers.

New Haven, 4, 5, 16 July, 1920, 16 July, 1921, 2 July, 1922 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.).

D. inimicus (Say). *Jassus inimicus* Say. *Jassus sex-punctata* Provancher.

Jour. Acad. Nat. Sci. Phila., vi, 305, 1831.

Vertex considerably broader than median length, bluntly angled. Varying greatly in intensity of coloration but always with six black spots in two longitudinal rows. Two spots on margin of vertex, two on anterior margin of pronotum and two in basal angles of scutellum. Elytra long, the cells usually heavily marked with fuscous. Outer clavus heavily reticulated. Female segment excavated either side of a rather broad median tooth. Length 4.5 mm.

One of the few species of greatest economic importance, and having a great variety of food plants. It is a common grass feeder, but is also important in its relation to garden, cereal and forage crops as well as a pest of pasture and meadow.

New Haven, 3 Oct., 1902 (B. H. W.); 16 Oct., 4 Nov., 1903 (H. L. V.); 27 June, 1907 (W. E. B.); 26 June, 1912, 8 July, 1912 (at light); 4, 5, 11, 17, 18, 23, 27, 31 July, 8, Aug., 22 Sept., 1920 (B. H. W.); Kent, 31 Aug., 1904 (W. E. B.); Wethersfield, 24 June, 1913 (L. B. R.); Hamden, 20 June, 1920 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Meriden, 28 July, 1909 (A. I. B.); North Haven, 24 Sept., 1921 (B. H. W.); Marlborough, 15 July, 1922 (B. H. W.).

D. flavicosta Stål. *D. flavocostatus* Van Duzee. *D. retrorsus* Uhler.

Rio. Jan. Hemip., ii, 53, 1862.

Vertex broader than long, very bluntly angled, almost rounded

at tip. Dark testaceous to black, vertex with ocelli, spots along margin, one on disc and one inside either eye, whitish. Elytra with basal half of costal margin broadly yellow margined, cross veins from costa and apical margin, white. Veins pale on apical half. Female segment slightly rounded or truncated posteriorly. Length 3-3.5 mm.

The records from New Haven are apparently quite northern for this typical and common southern form where it is abundant in meadows throughout the summer.

New Haven, 3 Oct., 1902 (B. H. W.); 11, 16, 18, 27 July, 1920 (B. H. W.); 8 July, 1912 (at light); North Haven, Sept., 1921 (B. H. W.).

D. debilis Uhler. *D. melsheimeri* Osborn and Ball.

Bull. U. S. Geol. Geog. Surv. Terr., i, 360, 1876.

Large green species with vertex distinctly angled, as long at middle as width between eyes, yellowish green in color, unmarked. Face slightly infuscated, usually pale. Elytra a uniform green with venation conspicuous. Female segment slightly produced and notched at middle, either side of which is a black mark. Male plates convexly rounded and very blunt at apex. Length 4-4.5 mm.

This species is rather widely distributed throughout the northern states usually occurring on grasses in low wooded areas.

D. abdominalis (Fabricius). *Cercopis abdominalis* Fabricius.

Cicada bicolor Fabricius. *Cicada balteata* Zetterstedt.

Aphrodis juvenca Hardy.

Syst. Rhyng., 98, 1803.

Resembling *debilis* but with vertex distinctly broader than long, more bluntly angled and pronotum with very short lateral margins. Greenish, vertex and anterior portion of pronotum yellowish. Face dark or black at base. Elytra greenish, opaque, often black or with black areas, usually subhyaline at apex. Venation as a rule obscured. Female segment slightly excavated, black margined and often incised at middle. Male plates longer than *debilis*, well rounded at apices. Length 4.5 mm.

Inhabits low grassy, often swampy areas, and feeds on coarse vegetation in these habitats. It is a common form in the northern states and Canada as well as Europe.

D. pascuellus (Fallen). *Cicada pascuellus* Fallen. *Cicada punctipes* Zetterstedt. *D. minkii* Provancher. (Fig. 11, 6a, b, c.)

Hemip. Suec., Cicad., 32, 1826.

Vertex obtusely angled, almost rounded, wider between eyes than median length; yellow, a point either side of apex black. Face infuscated, with numerous pale arcs and a black line at base. Elytra greenish, subhyaline, nervures conspicuous. Female segment gradually, rather deeply excavated, deeply incised at center, lateral angles prominent. Male plates broad at base narrowed to blunt tips. Length 3.5 mm.

An European form now recognized as a pest of economic impor-

tance in meadows of New England and some of the middle Atlantic states, feeding on grasses in low areas during July, August and September.

Branford, Cheshire and New Haven, 22 Sept., 1918 (F. H. L. and D. M. D.); 14 June, 7, 11, 18 July, 8 Aug., 1920 (B. H. W.); Cornwall, 22 Oct., 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); North Branford, 13 July, 1920 (B. H. W.); Killingworth, 27 June, 1920 (B. H. W.); New Haven, 25 June, 1921 (B. H. W.).

D. minimus Osborn and Ball. *Deltocephalus melsheimerii* Van Duzee.

Proc. Ia. Acad. Sci., iv, 211, 1897.

Very small, vertex produced, longer than width between eyes, bluntly angled at tip. Pronotum very strongly convex anteriorly, lateral margin almost obsolete. Vertex yellowish green, ocelli black, margin slightly infuscated. Elytra greenish, subhyaline, venation somewhat obscured. Female segment slightly produced, medially notched, with a black spot either side. Male plates long, gradually narrowed to acute tips. A black spot near middle of either plate. Length 2.75-3 mm.

This species resembles closely *melsheimerii* (Fitch), and they are frequently confused in collections. Common on grasses in pastures and uncultivated areas. Old pastures are ideal feeding places in July and August.

New Haven, 3 Oct., 1902 (B. H. W.).

D. striatus (Linnaeus). *Cicada striata* Linnaeus. *Jassus striata* Herrich-Schaeffer. *Deltocephalus striatus* Flor. *Deltocephalus sabulicola* Curtis. *Deltocephalus affinis* Gillette and Baker. *Deltocephalus affinis* Van Duzee. (Pl. iii, 5.)

Hemip. Col., 84, 1895.

Robust, vertex wider than long, obtusely angled, yellow or fuscous, often with darker markings. Pronotum with very short lateral margins and marked with darker longitudinal bands. Elytra dull green, venation paler and conspicuous. Face infuscated, with numerous pale arcs. Female segment concavely rounded. Male plates very short and rounded, scarcely exceeding convex valve. Length 3.5-4 mm.

Quite variable in coloration, often pale or heavily marked.

A very common and widely distributed form throughout the summer feeding in pastures and meadows on field and swamp grasses. Common in New England.

There has been some confusion regarding the synonymy of this species but a careful study of European material and material from Prof. Gillette show them to be the same species which has been described at least twice in Europe and once in this country.

New Haven, 14, 20 June, 1920, 29 May, 1921 (B. H. W.).

D. nominatus Sanders and DeLong. *Deltocephalus oculatus* Osborn and Ball.

Penn. Bur. Pl. Ind., Tech. Bull. No. 1, 9, 1920; Proc. Ia. Acad. Sci., iv, 212, 1897.

Vertex produced and acutely angled but a little blunt at tip. Pronotum very strongly convex anteriorly. Straw yellow, ocelli and median impressed line of vertex black. Elytra subhyaline, nervures pale. Female segment with a slightly produced portion at middle, black and trilobate. Male plates rather broad at base, tips narrow, acutely angled and attenuated. Length 3.2 mm.

A rather common form on *Andropogon* grasses in high fields or rather dry places. It is more commonly found in western and southern localities, and although not definitely reported from New England it may occur rather sparsely.

New Haven, 14 June, 7, 20 July, 1920 (B. H. W.); North Haven, 4 Sept., 1921; Madison, 24 Sept., 1922 (B. H. W.).

D. littoralis Ball.

Proc. Biol. Soc. Wash., xviii, 120, 1905.

Vertex produced, obtusely angled, wider than median length. dull yellow, ocelli black and a suggestion of brownish reflexed arcs. Elytra dull greenish, subhyaline, venation pale and conspicuous; rather short, in female exceeded by abdomen. Female segment triangularly produced from base, a notch either side just before apex, forming three rather distinct teeth. The processes of an underlying segment visible at each side. Male plates short concavely narrowed to pointed tips. Length 3.5-4 mm.

It has been found only on *Distichlis spicata* on sandy areas of the Atlantic Coast, but seems to have a rather wide distribution over such areas during June, July and August.

Rowayton, 5 Aug., 1909 (C. W. J.).

D. melsheimerii (Fitch). *Amblycephalus melsheimerii* Fitch.
D. vicilinus Crumb.

Homop. N. Y. St. Cab., 61, 1851.

A small species with pointed head. Vertex strongly produced and sharply angled, distinctly longer than width between eyes and longer than pronotum. Female usually rather uniform yellowish, elytra subhyaline, nervures milky white, face with faint arcs. Male brighter yellow, a faint brown arc either side from apex to black ocelli, white nervures of elytra faintly bordered with fuscous throughout. Six or seven pairs of arcs on face. Female last ventral segment about equaling preceding, median half of posterior margin with simple, very shallow, black bordered excavation. Male valve almost semi-circular, considerably longer than preceding segment; plates broad at base, only slightly narrowed to broadly rounded upturned tips, appearing from below as almost truncate. Length 2.5-2.75 mm.

A very common meadow species which is distributed over a large area in the eastern United States. Since its description in 1851 this species has been confused with *minimum* Osborn and Ball, and

striatus Linnaeus (*affinis* Gillette and Baker). An examination of the type has proven that this species is distinct, and is the same as *vicilinus* described by Crumb in 1915.

New Haven, 8 Oct., 1902. (B. H. W.); 7, 11 July, 1920 (B. H. W.; Hamden, 5 July, 1920 (P. Garman); North Branford, 12 June, 1921 (B. H. W.).

D. sylvestris Osborn and Ball. (Fig. 11, 4a, b, c, d.) (Pl. iii, 6.)

Proc. Ia. Acad. Sci., iv, 213, 1897.

Vertex longer than width between eyes, acutely angled, dull greenish with a curved line from apex toward each ocellus, and a longitudinal stripe either side of middle, fuscous. Elytra rather long, greenish subhyaline, nervures pale, often slightly fuscous margined. Female segment abruptly produced and black on median third. Male plates long, concavely rounded to blunt apices. Length 3.5 mm.

Feeds in waste places and sheltered areas, on short grasses during June, July and in late summer.

New Haven, 22 Sept., 1918 (F. H. L. and D. M. D.); 11 July, 1920 (B. H. W.); North Branford, 2 June, 1921 (B. H. W.).

D. acus Sanders and DeLong.

Penn. Bur. Pl. Ind., Tech. Bull. No. 1, 10, 1920.

Vertex sharply angled, one-fifth longer on middle than width between eyes. Greenish yellow, an arcuate line from apex to eye, pale brown. Elytra milky hyaline, veins paler, faintly bordered with fuscous. Female last ventral segment slightly longer than preceding, hind margin with median half produced, forming a broad pointed tooth with sinuate sides, margined with brown. Male valve triangularly rounded, as long as, but narrower than, last ventral segment. Plates at base as broad as last ventral segment, twice length of valve, concavely narrowed to round pointed tips. Length 4 mm.

An abundant and widespread species found in grassy and swampy areas and which apparently has been confused for some time with *melsheimerii* and *nominatus*, both of which it resembles.

New Haven, July 11, 1920 (B. H. W.).

D. simplex Van Duzee.

Trans. Am. Ent. Soc., xix, 304, 1892.

Vertex at least one-third wider than long, very bluntly and obtusely angled, greenish yellow with four black spots just back of margin, a pair of triangular spots at apex and one next either eye just above ocellus. Elytra rather long, dull green or whitish, veins bright green. Female segment with lateral lobes rounded, excavated either side of broad median tooth. Portions of under segment visible at the sides. Male plates very broad at base, concavely, abruptly narrowed at half their length to elongated pointed tips. Length 5-5.5 mm.

Occurs on *Spartina patens* in swampy areas.

Stratford, 21 July, 1912 (at light), 9 July, 1920 (B. H. W.); also reported from Branford and Stony Creek without specific dates; New Haven, 1 Aug., 1920 (B. H. W.); Fairfield, 26 Aug., 1920 (B. H. W.).

D. osborni Van Duzee.

Trans. Am. Ent. Soc., xix, 304, 1892.

Broad and robust, vertex one-third wider than long, very blunt, almost rounded at tip, a pair of large black spots at apex, and often a smaller one each side next ocellus. Sometimes with fuscous blotches on disc. In pale specimens some or all of these markings may be absent. Pronotum yellowish with longitudinal white stripes. Elytra broad, dull yellow, subhyaline, nervures white, broadly fuscous margined. Female segment slightly bisinuated and dark margined at middle. Male plates broad at base, concavely rounded to acute tips. Length 4.5-5 mm.

Found on tall grasses often in swampy places, but usually in rather small numbers during July, August and September.

D. balli Van Duzee. *nigrifrons* Van Duzee.

Check List Hemip., 71, 1916; Trans. Am. Ent. Soc., xxi, 293, 1894.

Vertex twice as long as wide, rounded anteriorly, yellow with four large black spots above margin and a smaller one next either eye. The outer spots are often fused with paler areas on the disc almost forming a transverse band. Face black with a median stripe and numerous arcs, yellow. Venter black. Elytra brownish green, subhyaline, nervures paler. Female segment concave with a slight median tooth and brownish portion at middle. Male plates gradually narrowed to sharp acute tips. Length 4 mm.

An important pest of cereal and forage crops and a very common member of the meadow and pasture groups feeding on cultivated and wild grasses.

Kent, 31 Aug., 1904 (W. E. B.); New Haven, 22 Sept., 1918 (F. H. L.).

Aconura Lethierry.

Athysanella Baker.

Vertex broad, obtusely angled, rounding to front. Pronotum usually shorter than vertex, transversely wrinkled posteriorly. The elytra are usually short and with abbreviated venation. Ovipositor very long comparatively.

The species of this genus feed upon short grasses of the prairie type which are found on dry uplands. Most of them occur throughout the plains region of the west but one species is known to occur in the New England states.

A. acuticauda (Baker). *Athysanella acuticauda* Baker.

Psyche, viii, 186, 1898.

Vertex blunt, angularly or roundingly produced, and broadly rounding to front. Pronotum very short and broad. Elytra short

covering only basal two or three segments of abdomen; occasionally reaching almost to tip of abdomen. Ovipositor in female long, body gradually tapering and wedge-shaped. Color dull green to brownish, vertex with a pair of large round black spots extending over on to the front and a spot on middle of front visible from above. Elytra often striped with brown, abdomen marked with brownish spots and darker areas. Female segment with lateral angles produced, between which the posterior border is emarginate either side of a slightly produced broad median lobe. Male valve strongly roundly produced, plates short and broad, divergent, bluntly pointed, notched on outer margins. Length female, 4 mm.; male, 3 mm.

A rather abundant species in dry upland pastures and meadows where the soil is well drained and short grasses are the principal species.

New Haven, 8 May, 1921 (B. H. W.).

Driotura Osborn and Ball.

Head short, almost parallel margined, obtuse, face short and broad. Pronotum short, transversely striate posteriorly. Elytra coarsely rugose, short, extending either to second abdominal segment only, or almost to end of abdomen.

D. gammaroides (Van Duzee) *Athysanus gammaroides* Van Duzee. (Fig. 10, 1.)

Bull. Buff. Soc. Nat. Sci., v, 209, 1894.

Black, shining, usually unmarked, short, robust, elytra coarsely rugose, usually extending only to second segment of abdomen. Length 3-4 mm.

Frequents waste areas where wild grasses are common, or often pastures of several years standing. Common in many areas.

Stonington, 16 May, 1906; New Haven, 13 May, 1911 (B. H. W.); 31 July, 8 Aug., 1920 (B. H. W.); Killingworth, 31 May, 1920 (B. H. W.); Hamden, 10 Apr., 1921 (B. H. W.); Ellington, 25 Aug., 1920 (B. H. W.); Orange, 21 July, 1905 (W. E. B.).

Euscelis Brullé.

Phrynomorphus Curtis.

Athysanus Burmeister.

Opsius Fieber.

Body usually robust, vertex obtuse, often roundly angled, sometimes rounded and almost parallel margined, not forming a definite margin with front. Elytra usually shorter or only slightly exceeding abdomen, with one cross vein.

Four very distinct groups any one of which might easily be considered as a genus are found here. So the species can scarcely

be characterized as regards many structural characters. If the cross nervures between the sectors were of importance they would be of service here as factors in classification, but their relative significance is still an open question.

In regard to feeding habits they closely resemble and are associated with species of *Deltocephalus*, being found almost entirely on grasses and low forms of vegetation.

Key to Species.

1. Anterior margin of vertex slightly produced before the eyes, wider than long 2
Anterior margin of vertex usually well produced before the eyes, angled with front or somewhat conical 5
2. Vertex with heavy black band between the eyes, elytra greenish, nervures pale 3
Margin of vertex with two large round black spots, elytra whitish hyaline, nervures dark **exitosus**
3. Length 4.5 mm. or more, head very slightly produced 4
Smaller, 3.5 mm., wedge-shaped, head more produced at middle **cuneatus**
4. Vertex slightly produced at middle, band on vertex narrow, length less than 5 mm. **striolus**
Vertex parallel margined, band on vertex broad, length 6 mm. **parallelus**
5. Vertex wider than length at middle 6
Vertex as long as width at base, yellow with two large round spots above apex **curtisii**
6. Species rather short and very broad, elytra short, scarcely exceeding abdomen, central anteapical cell not constricted 7
Species smaller and more elongate, elytra usually longer than abdomen. Central anteapical cell constricted at middle 11
7. Very broad, pale, or light brown with white spot on cross nervure 8
Narrower, usually black, or dark brown, without white spot on cross nervure 10
8. Vertex rounded, less than twice as long at middle as next the eye 9
Vertex angled, twice as long on middle as next the eye, two spots close to apex, and an interrupted band between eyes **extrusus**
9. Vertex unmarked or with two round spots **relativus**
Vertex with transverse bands, a broad white spot on cross nervures **varus**
10. Vertex angled, nearly twice as long on middle as next eyes, yellow at base **uhleri**
Vertex rounding, little longer on middle than next eye. Shining black **anthracinus**
11. Elytra distinctly longer than body, more than 4 mm. in length 12
Elytra not exceeding abdomen in length, vertex with transverse band between anterior margins of eyes **arctostaphyli**
12. Shorter and broader, vertex more obtusely angled, elytra broader at tip, color brownish, nervures pale, dark margined 13
Long and very narrow, vertex sharply angled, elytra tapering, color black, vertex with pale lines and markings, nervures pale **elongatus**
13. Vertex brown with transverse fuscous markings, face dark 14
Vertex fulvous without definite markings, face testaceous **symporicarpae**
14. Pale olive testaceous tinged with tawny, tibia orange **vaccinii**
Dark brown without tawny color, legs dark **striatulus**

E. exitiosus (Uhler). *Cicadula exitiosus* Uhler.

Am. Ent., iii, 72, 1880.

A variable species with rounded head. Two black spots on rounded margin of vertex, two oblique dashes on basal angles, and a dark crescent-shaped band between eyes. Four transverse black spots near anterior margin of pronotum and black markings in basal angles of scutellum; elytra hyaline, nervures black. Length 3.5-4.5 mm.

A southern and southwestern species, no doubt found occasionally in the state during July, August and September.

E. cuneatus Sanders and DeLong.

Penn. Bur. Pl. Ind., Tech. Bull. i, 17, 1920.

The smallest of the black banded vertex species of this group. Wedge-shaped, head including eyes wider than pronotum, vertex slightly produced and rounded. Yellowish green, a line below ocelli, a band between eyes, sometimes interrupted and a triangular spot at apex, black. Elytra smoky subhyaline, nervures yellowish. Face with black arcs, sutures and antennal pits. Female last ventral segment with pointed lateral angles, posterior margin concave to a short median black tooth. Male valve broadly triangular with rounded apex, plates long, tapered to attenuated tips. Length 3-3.5 mm.

A very common and abundant species in moist places. It frequents lagoon margins and has been taken from *Juncus* and *Cyperus*.

New Haven, 20 Aug., 1920, 19 June, 1921 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.).

E. striolus (Fallen). *Cicadula striolus* Fallen. *Jassus frenatus* Germar. (Fig. 10, 6.)

Acta Holm, xxvii, 31, 1806.

Vertex a little longer on middle than next eyes, almost parallel margined, green with a transverse black stripe on vertex between eyes, a waved one on margin, and arcs on face, black. Elytra sordid green, nervures paler. Female last ventral segment strongly concavely rounded. Male valve obtusely triangular, plates with outer margins straight, tips bluntly angled. Length 3.5-4.5 mm.

Occurs in swampy and boggy places and is found in great numbers on *Juncus* along moist margins of ponds and lagoons during July, August and September.

Reported from Branford; Stratford, 9 June, 1920 (B. H. W.).

E. parallelus (Van Duzee). *Athysanus parallelus* Van Duzee. (Fig. 8, 6; Fig. 10, 2.)

Can. Ent., xxiii, 169, 1891.

A much larger and broader species than the two preceding. Vertex parallel margined, green, with a broad transverse band

covering anterior portion of vertex, and arcs of face, black. Elytra often with longitudinal black markings, nervures pale. Female last ventral segment with broadly rounded lateral angles, posterior margin rather narrowly, deeply concave. Male valve obtusely angled, plates short and broad, tips broadly, bluntly rounded. Length 6 mm.

Occurs in company with the two preceding species in swampy places on small sedges. It should be found abundantly in the state.

Branford, 21 July, 1920 (B. H. W.); New Haven, 11 July, 1920 (B. H. W.).

E. extrusus (Van Duzee). *Athysanus extrusus* Van Duzee.
Athysanus venosus Osborn.

Can. Ent., xxv, 283, 1893.

Rather short, quite broad; vertex obtusely angled, yellowish with four triangular spots and often an interrupted transverse band between eyes. Pronotum irregularly marked with brown. Elytra short and broad, nervures pale, margined with fuscous. Female last ventral segment with lateral angles triangularly produced, posterior margin truncated on middle half. Male valve obtusely triangular, plates divergent to the parallel outer margins. Style-like tips of pygofers extending far beyond the plates. Length 4.2-5.2 mm.

Frequently found in meadows on grasses, but rarely in sufficient abundance to be considered of economic importance. It commonly occurs in marshy places on sedges.

Mount Carmel, 25 May, 1906; New Haven, 19, 26 June, 1910; Hamden, 28 May, 1911; North Branford, 8 June, 1912, 23 May, 1922 (B. H. W.); Killingworth, 31 May, 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); East Haven, 10 May, 1921 (B. H. W.); Guilford, 13 July, 1921 (B. H. W.); Portland, 25 July, 1920 (B. H. W.).

E. relativus (Gillette and Baker). *Athysanus relativus* Gillette and Baker. *Athysanus obsoletus* Provancher.

Hemip. Col., 93, 1895.

Vertex quite bluntly angled, rounding in front, pale straw yellow, sometimes with a pair of dark spots on vertex. Elytra very short, often not reaching the tip of abdomen, yellowish subhyaline, nervures indistinct. Female last ventral segment with posterior margin roundly, rather shallowly emarginate, a small pointed black tooth in its apex. Male valve short, triangular; plates three times as long as valve, roundly narrowed to broad, blunt apices. Length 4.5-5 mm.

A northern form which has been taken in the state although more abundant in the western United States. It feeds on grasses in meadows.

New Haven, 9 Nov., 1903 (H. L. V.); 22 Sept., 1920 (B. H. W.).

E. varus (Ball). *Athysanus varus* Ball.

Can. Ent., xxxiii, 5, 1901.

Vertex with broad, sloping apex, straw yellow with transverse

bands; form slender, elytra long and narrow, dark with light nervures, especially the cross nervures. Female last ventral segment with posterior margin nearly truncate, median third slightly produced. Male valve semicircular, plates triangular, three times as long as valve. Length 4.25-5 mm.

Perhaps very rare in the state, occurring normally on the plains in the west.

Definitely reported from Connecticut.

E. uhleri (Ball). *Athysanus uhleri* Ball. *Athysanus plutonius* Provancher.

Can. Ent., xliii, 200, 1911.

Vertex obtusely angled, sides straight, black, a pale transverse band on base of vertex, and pale spots near apex. Pronotum and scutellum mottled. Elytra exceeding abdomen, almost truncate at apex, nervures usually yellow. Length 4-4.5 mm.

Often collected in company with *anthracinus* in high pastures, frequently on poor land where only very short rather dry grasses are found.

New Haven, 26 June, 1912 (at light); 5 Aug., 1920, 4 July, 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Guilford, 24 July, 1921 (B. H. W.); Huntington, 9 July, 1921 (B. H. W.); New Haven, 12 June, 1921; 4 July, 1921 (B. H. W.).

E. anthracinus (Van Duzee). *Athysanus anthracinus* Van Duzee.

Can. Ent., xxvi, 136, 1894.

Black shining, vertex more rounded than in *uhleri*, tibia of first and second legs yellow. Traces of pale arcs on face. Elytra black, veins indistinct. Length 3.5-4 mm.

Collected in rather high and dry meadows where it feeds in abundance on very short grasses.

Thompson, 11 July, 1905 (H. L. V.); Orange, 21 July, 1905 (W. E. B.); New Haven, 4, 5 July, 1920, 3, 9 July, 1921 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); North Branford, 16 June, 1922 (B. H. W.).

E. symphoricarpe (Ball). *Athysanus symphoricarpe* Ball.

Can. Ent., xxxiii, 5, 1901.

Vertex broadly rounded, apex blunt and conical. Pale testaceous, vertex usually reddish. Elytra with pale nervures. Length 4.5 mm.

Reported for Massachusetts and undoubtedly has a wider distribution throughout New England.

E. arctostaphyli (Ball). *Athysanus arctostaphyli* Ball.

Ent. News, x, 172, 1899.

Vertex slightly, obtusely angulate, apex conically produced, yellowish with two and often three rather definite transverse bands. Elytral nervures pale, margined with fuscous. Length 3.5-4 mm.

Occurs on bearberry (*Arctostaphylus*), and usually found in a heath habitat on high ground, and in mountainous regions, July and August.

E. striatulus (Fallen). *Cicada striatulus* Fallen. *Jassus plutonius* Uhler. *Athysanus vaccinii* Osborn and Ball.

Hemip. Suec., Cicad., 45, 1826.

Dark brown without tawny tinge, legs dark in color, vertex with three dark interrupted transverse lines between eyes. Length 4-4.5 mm.

A common form in bogs on blueberry and allied plants in August and September.

New Haven, 4 July, 1921; Portland, 25 July, 1920 (B. H. W.).

E. vaccinii (Van Duzee).

Ent. Amer., vi, 135, 1890.

Perhaps not distinct from *striatulus* and at least quite similar in form and coloration. Paler and with fewer dark markings, olive testaceous tinged with tawny, all the tibia orange. Length 4-4.5 mm.

Found with the preceding in boggy areas occurring on blueberry.

New Haven, 4 July, 1920, 4 July, 1921 (B. H. W.). Sweet fern.

E. elongatus (Osborn). *Athysanus elongatus* Osborn.

Me. Agr. Expt. Sta., Bull. 238, 1915.

Narrow, black with yellow markings. Vertex obtusely angled, black with basal spots and three on disc, yellow. Frontal arcs on face, spots on anterior margin of pronotum and outer angles of scutellum yellow. Elytra yellowish hyaline, veins fuscous margined. Length 3.25-4 mm.

Often common in low pasture land on grasses during July and August.

E. curtisii (Fitch). *Amblycephalus curtisii* Fitch. *Jassus nervatus* Provancher. (Pl. iii, 9.)

Homop. N. Y. St. Cab., 61, 1851.

Vertex angled, greenish yellow with two large black spots on disc and an irregular one at apex black. Anterior half of pronotum and a narrow posterior margin, black. Elytra dark fuscous, margins and nervures yellow. Length 3-3.5 mm.

Occurs in good numbers in grassy pastures and meadows.

Thompson, 11 July, 1905, Putnam, 12 July, 1905 (H. L. V.); New Haven, 22 Sept., 1918 (F. H. L., D. M. D.), 20 June, 1920 (B. H. W.); Branford, 21 July, 1920 (B. H. W.); Cornwall, 22 Oct., 1920 (B. H. W.); Orange, 22 June, 1920, Waterbury, 15 Oct., 1920 (B. H. W.); North Branford, 12 June, 1921 (B. H. W.).

Eutettix Van Duzee.

Vertex rather short and sloping, distinctly transversely impressed, elytra rather broad with one cross nervure between the sectors. Ramose pigment lines when present, aggregated into oblique bands or saddle areas. Usually conspicuously and often brightly colored.

Several of the species of the genus are two brooded, others only one and the food plants although specific in most cases for each species, range from trees and shrubs to various grasses and herbs. As a group they seem to prefer wooded and shaded areas.

Key to Species.

1. Elytra with one cross nervure between the sectors, costal margin without supernumerary veinlets 2
Elytra with two cross nervures between the sectors or supernumerary veinlets to costa 7
2. Elytra without markings in the form of transverse bands or ramose lines 3
Elytra with a definite oblique band across posterior half of clavus 6
3. Vertex and pronotum pale, usually yellow, elytra dark with a white commissural spot 4
Vertex often pale, pronotum same color as elytra 5
4. Vertex and pronotum yellow, unmarked, elytra tawny, nervures indistinct *luridus*
Margin of vertex with a transverse black band, elytra creamy with brownish coloring around pale commissural spot *slossoni*
5. Whole insect mottled with brown *marmoratus*
Uniformly reddish or chestnut-brown *southwicki*
6. Pronotum and anterior half of elytra milky white, posterior portion with a transverse brownish band *seminudus*
Whole insect with reddish tint, band on posterior half usually much darker *strobi*
7. Vertex with six black spots on anterior margin, elytra fulvous yellow with white spots *johnsoni*
Vertex unmarked, elytra fuscous with a definite light band across first cross nervure between the sectors *cinctus*

E. luridus (Van Duzee). *Thamnotettix luridus* Van Duzee.

Can. Ent., xxii, 250, 1890.

Vertex, pronotum and scutellum fulvous, elytra testaceous brown, paler toward costa, with commissural spot creamy yellow. Length 6 mm.

Occurs on undergrowth in wooded or cut over areas, a rather widely distributed form which should occur in New England during August and September.

E. marmoratus Van Duzee. *Eutettix incerta* Gillette and Baker.

Trans. Am. Ent. Soc., xix, 302, 1892.

Pale yellowish brown, vertex with a line in transverse depression, two spots at apex, four along base and median impressed line, testaceous. Elytra subhyaline with testaceous blotches and a white spot on commissure. Length 5.5 mm.

Frequently found on herbaceous plants in wooded areas during early spring and August.

Lyme, 16 June, 1918 (B. H. W.); Stonington, 19 May, 1914 (I. W. D.); Plainville, 2 Sept., 1921 (B. H. W.).

E. southwicki (Van Duzee). *Eutettix brunneus* Osborn.

Bull. Buff. Soc. Nat. Sci., v, 209, 1894.

Vertex dull yellowish irregularly marked with testaceous.

Pronotum brown, elytra of a uniform testaceous color, smoky at tips. Length 4 mm.

Occurs under similar conditions as preceding in early spring and late summer.

E. slossoni Van Duzee.

Bull. Buff. Soc. Nat. Sci., v, 210, 1894.

Creamy yellow, a broad black band on base of front, extending a little upon vertex, bisected at middle. A faint brownish transverse band on posterior portion of pronotum. Elytra mottled with brown. Length 5.5 mm.

A southern form which may be taken in the state.

E. johnsoni Van Duzee. (Fig. 9, 12.)

Can. Ent., xxvi, 137, 1894.

General appearance of *Mesamia vitellina* but smaller with shorter vertex and marked with black. Orange-yellow, an interrupted line below margin and six dashes above, black, three stripes on pronotum and oval spots on elytra milky white. Length 5 mm.

Apparently two brooded; occurs in rather open woods on undergrowth.

New Haven, 23 Oct., 1903 (H. L. V.); 22 Sept., 1918 (D. M. D.); 8 July, 1912 (at light); 4, 5, 7, 8, 11, 14, 31 July, 1920 (B. H. W.); East River, 2 Aug., 1910 (C. R. E.); Bridgeport, 20 Sept., 1920 (B. H. W.); Guilford, 26 July, 1920 (M. P. Z.); Orange, 17 July, 1920 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Norwalk, 8 Sept., 1920 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Milford, 13 July, 1920 (M. P. Z.); North Branford, 13 July, 1920, 16 June, 1921 (B. H. W.).

E. seminudus (Say). *Jassus seminudus* Say. (Pl. ii, 5; Fig. 10, 9.)

Jour. Acad. Nat. Sci. Phila., vi, 307, 1831.

Creamy white, scutellum irregularly marked with brown. Elytra milky white crossed on posterior half of clavus by a broad testaceous brown saddle narrowed at costa. Length 4.5-5 mm.

This form apparently has more than one food plant, often taken on shrubs or by sweeping in open fields.

New Haven, 27 June, 1908; 30 Aug., 1909 (W. E. B.); 4 Aug., 1909 (B. H. W.); 26 June, 8 July, 1912 (at light); 8 July, 1914 (M. P. Z.); 16, 29 July, 8 Aug., 1920 (B. H. W.); Cromwell, 27, 30 Aug., 1920 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Hamden, 11 June, 1921 (B. H. W.); Marlborough, 15 July, 1922 (B. H. W.).

E. cinctus Osborn and Ball. *E. Jucunda* Van Duzee. (Pl. ii, 4.)

Proc. Dav. Acad. Sci., vii, 97, 1898.

Vertex with apex bluntly conical, dirty greenish with saffron tint, pronotum brownish irrorate. Elytra pale, nervures reddish. A broad brown band across posterior half of clavus and extending obliquely back to costa. Length 5.3-6 mm.

Not abundant in northern states, occurring in wooded pasture areas on grasses and associated herbaceous plants.

New Haven, 21 Aug., 8 Oct., 1909 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.).

E. strobi (Fitch). *Bythoscopus strobi* Fitch.

Homop. N. Y. St. Cab., 58, 1851.

Vertex, pronotum and scutellum fulvo-testaceous, irrorate. Elytra milky white with basal and apical bands and a median saddle of reddish brown. Eyes red. Length 4.5-5.25 mm.

A two brooded species, the immature forms feeding on lamb's quarters. The adults occur on a variety of plants during June, July and August.

Westville, 9 Sept., 1907 (W. E. B.); New Haven, 8 July, 1912 (at light); 29 July, 1920 (B. H. W.); Hamden, 19 July, 1914 (M. P. Z.); Manchester, 16 Sept., 1920 (B. H. W.); Marlborough, 15 July, 1922 (B. H. W.).

Phlepsius Fieber.

Paraphlepsius Baker.

Parallygus Melichar.

Vertex usually obtusely angled or roundly produced, the anterior margin often angled, drawn out to a fine edge or frequently almost rounding to front. Elytra inscribed with ramose brown pigment lines, usually rather uniform, but when unevenly marked not forming saddle areas along suture.

A number of large species belong to this genus. The entire group feed on grass or herbaceous plants, and a number are

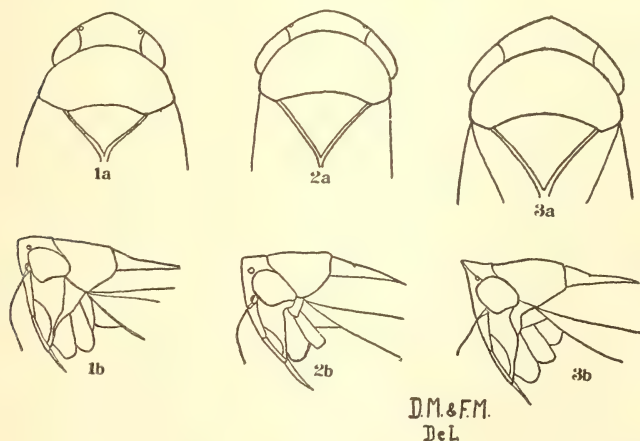


FIG. 12. (1a) *Phlepsius decorus* Osborn and Ball,—head, dorsal view; (1b) same, lateral view. (2a) *Phlepsius fuscipennis* Van Duzee,—head, dorsal view; (2b) same, lateral view. (3a) *Phlepsius solidaginis* Walker,—head, dorsal view; (3b) same, lateral view. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

meadow and pasture pests. Others live almost exclusively in heath, swamp or bog conditions, and with knowledge of their habitats often definite species can easily be collected since their conditions of living are often very restricted.

Key to Species.

1. Head narrower than pronotum. (Fig. 12, 1a.) 2
 Head as wide as or wider than pronotum. (Fig. 12, 2a.) 4
2. Large, exceeding 6.5 mm. in length, broad, but rather elongate ... 3
 Shorter and broader, not exceeding 6 mm. in length **decorus**
3. Resembling a *Gypona* in general, very large, 9 to 10 mm., bright reddish brown **majestus**
 Smaller, not exceeding 7 mm., fulvous, elytra with pale trilobate commissural line **excultus**
4. Margin of vertex often rather sharp and angulate, but never thin or foliaceous. (Fig. 12, 2b.) 5
 Margin of vertex with a thin sharp edge sometimes foliaceous. (Fig. 12, 3b.) 12
5. Margin of vertex very bluntly angled with the front which is rather strongly inflated 6
 Margin of vertex more angulate, rather sharp, front not strongly inflated 7
6. Head angularly produced, longer on middle than next eye, elytra sparsely inscribed, male plates short and broad **lobatus**
 Head not produced, scarcely longer on middle than next eye, elytra more heavily inscribed, male plates long, tapering. (Fig. 12, 2a.) **fuscipennis**
7. Elytra rather uniformly inscribed, usually no conspicuous dark blotches or bands 8
 Elytra with light and dark areas often appearing as transverse bands, usually conspicuous or with vertex and pronotum pale, and elytra dark 11
8. Short and robust not exceeding 5 mm. in length, female segment almost truncate with median notch **pusillus**
 Sometimes rather short but not robust, usually more than 5 mm. or if short with female segment not notched 9
9. Female segment truncate without teeth or incisions **truncatus**
 Female segment strongly incised or excavated on posterior margin 10
10. Broad with rather blunt head. Female segment roundly produced with deep triangular incision, not uniformly irrorate .. **incisus**
 Narrow with angled vertex. Female segment with rather deep, square excavation containing broad median tooth, rather uniformly irrorate **irroratus**
11. Vertex, pronotum and scutellum pale yellow, elytra with lighter areas at middle and apex of clavus, female segment with prominent angles, shallowly excavated with median notch **collitus**
 Vertex, pronotum and scutellum darker, elytra with clavus paler, female segment deeply, squarely excavated almost to base ... **apertus**
12. Small, 5.5-6.5 mm. 13
 Larger, 7-8.5 mm. Vertex and pronotum with markings, elytra evenly inscribed or stippled 14
13. Vertex, pronotum and scutellum pale yellow, unmarked, elytra uniformly evenly inscribed with heavy pigment lines, appearing very dark in color **fulvidorsum**
 Vertex often thick but flattened near apex, appearing pressed in above and below, vertex and pronotum pale in color heavily and irregularly mottled with brown. Elytra banded **tullahomi**

14. Entire dorsal surface rather evenly and thickly irrorate with small round black dots. A broad black band on base of face..... *atropunctatus* n. sp.
Dorsal surface marked with brownish ramose pigment lines..... 15
15. Vertex thin at margin, not foliaceous and only moderately produced. Vertex sloping, not concave. (Fig. 12, 3b.) 16
Vertex thin and foliaceous, strongly produced, margin slightly upturned, forming a slight concavity *ramosus*
16. Length 8-8.5 mm. Elytra distinctly narrowed apically *nebulosus*
Length 7-7.5 mm. Elytra slightly narrowed apically *solidaginis*

P. majestus Osborn and Ball.

Proc. Ia. Acad. Sci., iv, 229, 1897.

Very large and broad, resembling a *Gypona*, chestnut-brown. Head narrow, very slightly produced, a dark band between the eyes, often interrupted, and two spots before it and above apex, black. Anterior portion of pronotum with dark vermiculate markings. Elytra heavily inscribed with brown pigment lines. Length 9-10 mm.

Lives on tall grasses in thickets or rather densely shaded areas, and is a species difficult to capture because of its quick movements.

Lyme, 20 Aug., 1910; New Canaan, 14 Sept., 1911, Hamden, 6 Aug., 1922 (B. H. W.).

P. excultus (Uhler). *Jassus excultus* Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., iii, 467, 1877.

A narrow-headed form with vertex, pronotum and scutellum yellowish, a pair of small brown spots at base of vertex, and a pair of curved spots behind them on pronotum just back of margin. Elytra very closely inscribed with dark brown. Three lighter areas along suture indicating a trilobate spot. Female segment broadly roundly excavated at center. Length 7 mm.

On grasses usually in open fields. Primarily a southern form, but may occur in restricted northern areas.

P. decorus Osborn and Ball. (Fig. 12, 1.)

Proc. Ia. Acad. Sci., iv, 230, 1897.

A very short, broad, narrow-headed species. Vertex with two rather indefinite dark areas at tip and posterior half brownish. The elytra along scutellum and three spots along suture pale. Elytra not closely inscribed and with several pale areas, especially along costa. Length 6 mm.

On grasses, usually in wooded areas. A rather common but not abundant species throughout New England, May, June, July and September.

P. incisus Van Duzee.

Trans. Am. Ent. Soc., xix, 73, 1892.

Elytra brown, vertex, pronotum and scutellum yellow, mottled with brown. Vertex a little longer on middle than next eye. Female segment roundly triangulate with a rather broad deep notch at middle of hind margin. Length 6-6.5 mm.

A common pasture form on grasses during July and August in shaded areas, or in open woods. Often taken with *irroratus* which it resembles superficially.

Scotland, 17 July, Hartford, 9 Aug., 1904 (B. H. W.); Cornwall, 17 July, 1922 (B. H. W.).

P. fuscipennis Van Duzee. (Fig. 12, 2a, b.)

Trans. Am. Ent. Soc., xix, 70, 1892.

Vertex short, blunt, rounded in front without sharp edge. Pronotum strongly wrinkled. Male darker in color. Fulvous brown, elytra closely inscribed with fine brown lines. In female clouded with fulvous brown, a rather indefinite pale saddle on suture. Length 6-7 mm.

In great abundance in marshy areas on *Juncus-Eleocharis* especially during August and September.

Branford, 28 June, 1905 (H. W. W.); Stratford, 21 July, 1908 (B. H. W.); Westport, 24 June, 1921 (W. E. B.).

P. collitus Ball.

Can. Ent., xxxv, 227, 1903.

Vertex, pronotum and scutellum yellow, elytra brown with conspicuous irregular white areas. Vertex slightly angled, female segment deeply excavated either side of a prominent median tooth which is incised at center. Length 5-6 mm.

A common form occurring in open field and wooded areas on grasses during July, August and September.

Thompson, 11 July, 1906 (H. L. V.); New Haven, 21 Aug., 1909 (A. I. B.); 22 Sept., 1918 (D. M. D.); 8 July, 1920 (B. H. W.); Cromwell, 30 Aug., 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); Hamden, 20 Aug., 1922 (B. H. W.); New Haven, 16 July, 1920 (M. P. Z.).

P. irroratus (Say). *Jassus irroratus* Say. *Jassus testudinarius* Burmeister. Irrorate Leafhopper. (Fig. 10, 5.)

Jour. Acad. Nat. Sci. Phila., vi, 308, 1831.

A common small slender species, almost uniformly inscribed and irrorate with brown. Vertex angled, elytra long, narrowed posteriorly. Female segment squarely abruptly excavated with a broad median tooth. Length 5.5-6.5 mm.

In abundance over large areas occurring on many types of vegetation, and under various conditions, but especially found on grasses in pastures and meadows.

New Haven, 24 June, 1902 (E. J. S. M.); 3 Oct., 1902 (B. H. W.); 16 Oct., 1903 (H. L. V.); 27 June, 1908 (W. E. B.); 12, 17, 26 June, 1912; 8, 9 July, 1912 (at light); 4, 11, 14, 16, 29 July, 1920 (B. H. W.); Yalesville, 19 Oct., 1903 (H. L. V.); New Canaan, 14 Sept., 1906 (W. E. B.); 3 Sept., 1920 (B. H. W.); East Haven, 21 July, 1920 (B. H. W.); Hamden, 18 July, 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); East Hartford, 16 Sept., 1920, Cornwall, 22 Oct., 1920, Bridgeport, 20 Sept., 1920 (B. H. W.); Milford, 13 June, 1921 (B. H. W.); North Branford, 25 June, 1922 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); Norwalk, 8 Sept., 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.).

P. truncatus Van Duzee.

Trans. Amer. Ent. Soc., xix, 72, 1892.

Resembling *irroratus* in size and coloration. Vertex bluntly angled, one-fifth longer on middle than next eye. Color pale fulvus irrorate with brown, some white spots on posterior margin; elytra white very closely and finely reticulated causing a dark brown appearance. Female last ventral segment twice as long as preceding, truncated posteriorly, angles rounded. Male valve short, truncated, plates narrow, tips more obtuse than in *irroratus*. Length 5.5 to 6 mm.

This species is a grass feeder and has been taken with *irroratus* which it so closely resembles. The genital characters of both sexes will readily separate it.

Guilford, 26 July, 1920 (M. P. Z.).

P. pusillus Baker.

Ent. News, ix, 66, 1898.

Closely resembling and related to *altus* but slightly smaller, and with different genital characters. Short and robust, vertex obtusely angled. Pronotum very broad and short, elytra short. Color pale fulvous with darker markings, vertex and pronotum irregularly irrorate, elytra finely irrorate with brown. Female last ventral segment almost truncate, lateral lobes only slightly produced and broadly rounded, slightly concave either side of a median V-shaped notch. Male valve triangularly produced, plates broad at base gradually narrowed to rather blunt, incurved apices.

Specimens have been examined from other Atlantic coast localities and it seems to be eastern and southern in its distribution. The species occurs on short grasses.

New Haven, 31 July, 1920 (B. H. W.); 22 Sept., 1920 (B. H. W.).

P. lobatus Osborn.

Proc. Ia. Acad. Sci., v, 247, 1898.

Small, vertex obtusely angled, slightly produced. Pale brown in color, not closely inscribed on elytra. Female segment with marginal lobes, and a convex posterior border between them minutely notched at center. Length 5.5-5.75 mm.

Usually found in sandy or dry areas on short grasses during August.

Branford, 28 June, 1905 (H. W. W.).

P. apertus Van Duzee.

Trans. Am. Ent. Soc., xix, 76, 1892.

Vertex with obtusely angled apex. Elytra irregularly banded, often a cloud at base, a fulvous band across middle and another across antepical areoles. Head and pronotum tinged with fulvous. Female segment squarely, deeply excavated almost to base. Length 6.5 mm.

A northern form occurring throughout New England in pastures and moist areas during August and September.

P. tullahomi DeLong.

Tenn. St. Bd. Ent., Bull. 17, 73, 1916.

A banded species, closely related to *franconianus* but with a sharp-edged vertex, usually angularly produced as viewed from above. Vertex somewhat variable in length, from one-fourth to two-fifths as long at middle as width between the eyes. Face, vertex and pronotum pale, irregularly mottled with brownish. Elytra pale, the anterior half rather sparsely and the posterior half rather heavily inscribed with fine brownish lines and dots, giving the appearance of a pale anterior and a dark posterior portion. The coloration on posterior portion often broken into a more or less distinct narrow anterior, and a broader posterior, band.

Female last ventral segment almost twice as long as preceding; lateral angles prominent, posterior margin shallowly concavely rounded to two rather blunt, produced teeth at the middle between which is a shallow concave notch. Male valve triangular, as long as, and as wide at base as, last ventral segment, almost twice as wide as long. Plates twice longer than valve, rather narrow at base and gradually narrowed to very acutely pointed tips. These structures were incorrectly figured by the author in the Tennessee bulletin and the female has not previously been described.

The group of banded *Phlepsius* species is somewhat confusing but recent study has seemed to prove the specific rank of this form.

It is a meadow species and can easily be separated from *franconianus* which lives on pine.

New Haven, 7 July, 1920 (B. H. W.); Windsor, 27 Sept., 1922 (P. G.).

P. fulvidorsum (Fitch). *Jassus fulvidorsum* Fitch. (Pl. II, 6.)

Homop. N. Y. St. Cab., 62, 1851.

Resembling *collitus* but larger, vertex more angulate and elytra without white areas. Vertex well angled, edge sharp. Vertex, pronotum and scutellum yellow, elytra appearing dark brown, closely and heavily inscribed with pigment lines. Female segment broadly and deeply excavated, then slightly produced at middle and incised. Length 6-7 mm.

Rather abundant on short grasses and other low plants in dry and well shaded areas. This apparently is its optimum habitat.

New Haven, 17 July, 1908, 1, 22 Aug., 1920 (B. H. W.); Lyme, 20 Aug., 1910 (B. H. W.).

P. nebulosus Van Duzee.

Trans. Am. Ent. Soc., xix, 77, 1892.

Large, robust, vertex scarcely angled almost rounded, edge thin. Vertex and pronotum rather evenly irrorate with fulvous brown. Elytra rather closely and evenly inscribed, often with fulvous markings appearing in form of bands. Female segment broadly, shallowly excavated, slightly notched at middle. Length 8.5 mm.

Not abundant, usually taken from low grasses on dry or sandy areas.

Short Beach, 14 July, 1904; New Haven, 9 July, 1912 (B. H. W.).

P. solidaginis (Walker). *Acocephalus solidaginis* Walker.
Phlepsius humidus Van Duzee. (Fig. 12, 3a, b.)

List. Homop., iii, 847, 1851.

Large, broad, vertex produced, obtusely angled, anterior edge thin. Vertex and scutellum usually pale, yellowish. Elytra with three indistinct pale transverse bands. A fuscous spot on suture at middle and apex of clavus. Female segment with central half produced beyond lateral angles and notched at center. Length 7-7.5 mm.

Common on coarse grasses or sedges in moist areas or swamps, often abundant in low pastures and meadows.

New Haven, 20 July, 1908; 27 July, 1920 (B. H. W.); Hamden, 24 July, 1910; Lyme, 20 Aug., 1910 (B. H. W.); East Haven, 29 July, 1921 (B. H. W.).

P. ramosus (Baker). *Paraphlepsius ramosus* Baker.

Can. Ent., xxix, 158, 1897.

Similar to *solidaginis*, vertex strongly produced, apex angled, edge broadly thin. Elytra with dark and paler areas. Usually a dark transverse band across middle and often ramose brown lines forming an oval pale area including almost entire clavus. Female segment sinuated and notched at middle. Length 7 mm.

More abundant in boggy areas, occurring on grass clumps in a mixed Sphagnum-Tamarack habitat. It should occur under these conditions in the state.

***P. atropunctatus** DeLong, n. sp. (Fig. 13, 1-5.) (Pl. ii, 8.)

Vertex, pronotum, scutellum and elytra dull yellow, irrorate with small black spots. Length 7-7.2 mm.

Broad, very robust, vertex flat, one-half to two-thirds wider between eyes than median length, a little shorter than pronotum, anterior edge sharp. Face almost as broad as long, suddenly constricted to clypeus. Elytra rather broad, opaque, flaring at tips, veins rather obscure, appendix wanting.

Color: Vertex, pronotum, scutellum and elytra dull yellow, rather densely and finely irrorate with round black dots. Venation slightly brown, apical veins broadly margined with dark fuscous. Face yellowish, with two heavy black bands, sometimes fused, just below margin of vertex. Clypeus dusky at apex. Coxae of legs, and venter, black, male plates yellow, irrorate with black. Female venter milky white, last ventral segment and pygofer brownish, marked with black spots.

Genitalia: Female last ventral segment three and one-half times the length of preceding, side margins strongly curved, covering lateral plates. Lateral angles rounded and prominent; posterior margin sinuately concave a very shallow central notch. Ovipositor

distinctly longer than pygofers. Male plates longer than combined width at base, rather broad, gradually narrowed two-thirds their length then suddenly constricted and produced. Greatly exceeded by pygofers which are keeled at middle as in *Chlorotettix unicolor*.

Described from three specimens, a female and a male, collected at New Haven, July 29 and Sept. 22, 1920 (from willow), and a male from New Canaan, Conn. (Stephen Hoyt's Sons Nursery),

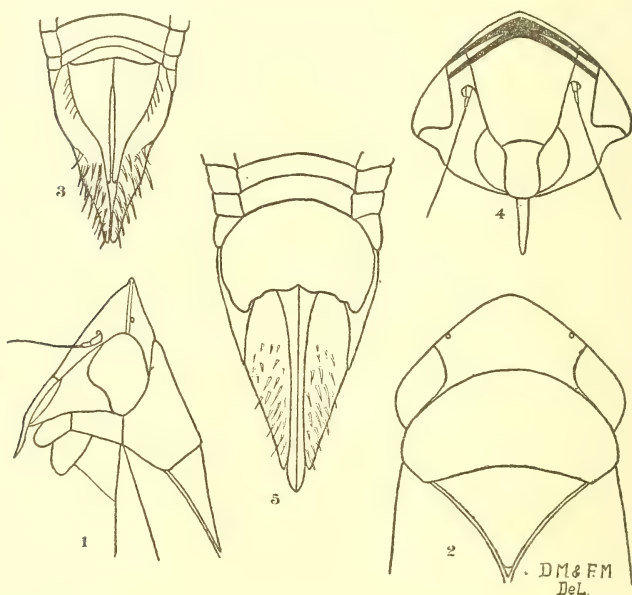


FIG. 13. *Phlepsius atropunctatus* DeLong,—(1) head, lateral view, (2) head, dorsal view, (3) male genitalia, (4) face, (5) female genitalia. All greatly enlarged. Drawing by D. M. and F. M. DeLong.

Sept. 17, 1918, all collected by B. H. Walden. This species apparently does not belong to an American genus and it has been quite difficult to place it with its closest relatives. In face characters it resembles a *Scaphoideus* but in general appearance a *Phlepsius* of the *ramosus* group.

This may not be an American species, but after considerable study of European material I have been unable to connect it even temporarily with a described species and it seems best to treat it as new in order that the record be established for North America. If the species later proves to be good it may be necessary to erect a genus for it.

Acinopterus Van Duzee.

Head narrower than pronotum, vertex short, obtusely angled. Elytra rather narrow, without appendix, costa feebly convex, narrowed to apex which is acutely angled.

A. acuminatus Van Duzee. (Fig. 9, 6; Fig. 10, 7.)

Psyche, vi, 308, 1892.

Easily recognized by the fulvous brown and greenish coloration, and the elytra which are acutely angled at apex. The basal angles of scutellum and tips of elytra often darker, nervures pale, disc of costa and discal areoles of corium whitish hyaline. Length 5-6.5 mm.

A grass-feeding species found commonly in the south but only occasionally in the north in pastures and waste places.

Rockville, 23 Aug., 1905 (H. L. V.).

Thamnotettix Zetterstedt.

Body usually elongate, vertex varying from broadly rounded to obtusely angled, the former type rounding to the front and the latter usually angled with front. Elytra as a rule possessing but one cross vein between the sectors. This will not hold good, however, for all species of the genus, as some resemble *Deltocephalus* in that respect.

They are diverse in food habits as well as structural characters and while some apparently live and feed entirely on trees or shrubs, others are grass feeders. Also some are two brooded and others apparently have but a single brood each season.

Key to Species.

1. Vertex short, broadly rounded, scarcely produced before eyes, almost parallel margined, rounded to meet face without definite margin 2
Vertex longer, somewhat produced, usually angulate, never parallel margined, decidedly angled with the front forming a definite margin 8
2. Vertex with two large black spots on rounded margin of apex .. 3
Vertex yellowish unmarked, pronotum, scutellum, outer margin and apex of clavus brown, clavus yellow *eburatus*
3. Elytra dark or subhyaline without yellow spot on clavus 4
Elytra dark with costal margin and a large spot on clavus, yellow 7
4. No dark bands on vertex, pronotum without band covering posterior half, wings dark or smoky, venation inconspicuous 5
A dark band on base of vertex between the eyes, a pale band covering posterior half of pronotum, elytra smoky with pale conspicuous venation *belli*
5. Entire insect brownish, not flecked with red, claval suture pale ... 6
Brownish, completely flecked with bright red, elytral veins same color *morsei*
6. Species large, 6 to 6.5 mm., claval suture conspicuous, narrow band across middle of pronotum *kennicotti*
Species smaller, less than 6 mm., claval suture almost colorous with elytra, faint suggestion of a band on pronotum *brittoni*

7. Yellow spot on clavus oval in form, and on central portion. **clitellarius**
Yellow spot narrow and elongated, extending along suture of elytra
from apex of scutellum to apex of clavus, vertex slightly pointed **collaris**
8. Species usually green, vertex with definite markings in form of spots or bands 9
Species green or yellow, vertex without definite markings in the form of spots or bands 15
9. Vertex with two or more spots on or above margin 10
Vertex with a broad black band on margin between eyes, species dark green, elytral apices smoky **smithi**
10. Principal markings on margin of vertex in form of black spots or dashes 11
Principal markings in the form of spots above margin on vertex .. 14
11. Markings on front four in number, either spots or dashes 12
Two elongated black spots on margin of vertex near apex, and two smaller ones above, one nearer either eye **decipiens**
12. Four spots on margin of vertex 13
Four elongated narrow dashes almost forming line on margin between eyes, vertex and pronotum pale with brownish longitudinal lines across them, elytra dark, nervures pale **cypraceus**
13. Four large round black spots on margin **melanogaster**
Four spots on margin, central two large, elongate, outer two smaller, a small black spot above either ocellus connected with a fine black line extending across antennal pit to base of clypeus **ciliatus**
14. Vertex angulate, four round black spots above margin, pronotum with pale longitudinal striae, elytra yellow, venation conspicuous, face pale **fitchi**
Vertex less angulate, six round black spots above margin, one very close to either eye, face black with pale arcs **nigrifrons**
15. Elytra quite hyaline, greenish or yellowish not dark or smoky 16
Elytra dark smoky only, subhyaline, veins yellowish, conspicuous, species broad **chlamydatus**
16. Greenish species, long and slender, head sharply angled, female segment truncated or slightly waved, without median tooth **inornatus**
Orange-yellow, rather broad, head quite bluntly angled, female segment excavated with a rather broad median tooth **placidus**

T. kennicotti (Uhler).

Trans. Am. Ent. Soc., ii, 161, 1863.

Rather large, vertex blunt, broadly rounded, almost parallel margined, two large black spots on rounded margin, ocelli and usually a line or band behind them, red. Pronotum with a pale median transverse band, rather narrow. Elytra brownish, smoky, claval suture conspicuously and broadly white. Length 6.5-7 mm.

A species commonly taken in shrub habitats often on oak, occurring usually in small numbers throughout the summer.

New Haven, 17 July, 1908; 20 Aug., 1909, and 26 June, 1910 (B. H. W.); 4, 7, 11, 25, 28 July, 3 Oct., 1920 (B. H. W.); East Haven, 21 July, 1920 (B. H. W.); North Branford, 13 July, 1920 (B. H. W.); Portland, 25 July, 1920 (B. H. W.).

***T. brittoni Osborn.**

Proc. Dav. Acad. Sci., x, 166, 1907.

Resembling *kennicotti* in general appearance but smaller, darker colored without conspicuous white claval vein. Dark brown,

vertex yellowish mottled with brown and with two black spots at apex. Vertex rounded in front. Elytra very dark brown. Length 5-5.75 mm.

A shrub-feeding form originally described from specimens collected by Dr. W. E. Britton in Connecticut. At present the known distribution is much greater.

New Haven, 6, 15, 20 July, 1904 (W. E. B.) (type material); 4, 5, 8, 11, 17, 31 July, 1920, 16 June, 1921 (B. H. W.) on *Steironema ciliatum*.

T. morsei Osborn.

Me. Agr. Expt. Sta., Bull. 238, 134, 1915.

Large brown species entirely flecked with red. Vertex rounded in front with a faint suggestion of an angle at apex, yellowish, closely flecked with red, two large black spots at apex. Elytra dark, deep red in appearance. Length 6 mm.

Feeds on willow shrubs from which it can be collected during August.

New Haven, 22 Sept., 1920, 16 June, 1921 (B. H. W.).

T. clitellarius (Say). *Jassus clitellarius* Say. The Saddle-Backed Leaf-hopper.

Jour. Acad. Nat. Sci. Phila., vi, 309, 1831.

A common dark brown species with an oval yellow "saddle" area on middle of elytra and a broad transverse yellow band on posterior portion of pronotum. Vertex rounded, yellow, apex with a pair of large black spots. Length 5-5.5 mm.

A common form in pastures and often taken from shrubs. It may be a cosmopolitan feeder, and breeding records will perhaps show that to be the case. This is one of our very common forms, and is of economic importance throughout the summer.

Woodmont, 22 June, 1904 (P. L. B.); West Haven, 27 June, 1905 (H. L. V.); New Haven, 8 June, 1904, 22 June, 1910 (W. E. B.); 27 July, 1904 (P. L. B.); 17, 22, 26 June, 8 July, 1912 (at light); 10, 14, 20 June, 31 July, 1920 (B. H. W.); Hamden, 14 June, 1911 (W. E. B.); Derby, 11 June, 1915 (M. P. Z.); Bridgeport, 20 Sept., 1920 (B. H. W.); Cromwell, 30 Aug., 1920 (B. H. W.); West Haven, 27 June, 1905 (H. L. V.); Cornwall, 5 June, 1921 (B. H. W.).

T. eburatus Van Duzee.

Can. Ent., xxi, 10, 1889.

Resembling somewhat *clitellarius* but paler and without spots on vertex. Vertex uniform dull yellow, pronotum brownish, darker anteriorly. Elytra yellowish to whitish hyaline, claval suture, base and tips of clavus along sutural margin, brown. Remainder of clavus yellowish, tips of elytra smoky. Length 6 mm.

Occurs in cut-over areas and on herbaceous plants in woodland. Its food plant is not definitely known.

East River, Aug., 1908 (C. R. E.); Guilford, 13 July, 1920 (B. H. W.).

T. collaris Ball. *T. exquisitos* Osborn. (Pl. II, 9.)

Can. Ent., xxxiv, 15, 1902.

Belonging to the *clitellarius* group but with "saddle" spot of yellow on the dark brown elytra more linear and elongated, extending from apex of scutellum to tip of clavus. Costal margin broadly pale to near apex. Vertex obtusely angled, yellow, apex with two black spots. A yellow transverse band across posterior half of pronotum. Length 5.5-6 mm.

Rather abundant in cool moist woods on *Impatiens* in the coarse grass-fern association during August, but occurring only in thick woods.

T. belli (Uhler). *Jassus belli* Uhler. *Thamnotettix sonorae* Gillette and Baker.

Bull. U. S. Geol. Geog. Surv. Terr., iii, 471, 1877.

Yellow to tawny, vertex slightly angled, two large black spots at apex and an interrupted band between eyes. Posterior portion of pronotum banded with pale. Elytra tawny with oblique pale lines parallel to claval vein. Length 5 mm.

A northern form occurring on shrubs in New England in May, July and August.

T. chlamydatus (Provancher). *Deltocephalus chlamydatus* Provancher. *T. infuscatus* Gillette and Baker. *T. punctiscuta* Gillette and Baker.

Pet. Faune Ent. Can., ii, 339, 1890.

Rather large robust species with vertex angled, brownish with a greenish tint seldom with definite markings. Elytra dark, veins paler. Female segment shallowly emarginate posteriorly. Length 6 mm.

A typical northern form apparently feeding on shrubs from which it is usually taken. Reported as occurring on birch and hazel in spring and late summer.

T. melanogaster (Provancher). *Jassus melanogaster* Provancher.

Nat. Can., iv, 378, 1872.

Yellow to green, vertex obtusely angulate with four large black spots about equidistant on margin of vertex. Female segment produced, slightly emarginate posteriorly. Length 5 mm.

A very common grass-feeding species throughout the summer in low wet pastures, and meadows. Abundant to such extent that it is of economic importance.

Yalesville, 19 Oct., 1903 (H. L. V.); New Haven, 26 June, 1910 (B. H. W.); 7, 11, 17 July, 22 Sept., 3 Oct., 1920 (B. H. W.); Branford, 21 July, 1920 (B. H. W.); New Canaan, 3 Sept., 1920, North Branford, 13 July, 1920, Orange, 17 July, 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.); Hamden, 23 Oct., 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

T. ciliatus Osborn.

Proc. Ia. Acad. Sci., v, 244, 1898.

Greenish with yellow vertex which is strongly rounded in front and has four black spots on margin. Two large ones at apex on

margin and a smaller one either side toward the eyes; just above each of outer spots on vertex is a fine black point and a black line extends over margin through antennal pit and follows suture of face to clypeus. Length 5-5.5 mm.

Feeds on grasses in pasture land during August and September.

T. decipiens Provancher.

Pet. Faune Ent. Can., iii, 285, 1890.

Greenish, elytra with iridescent tint and pale veins. Vertex very broadly obtusely angled, two large black spots on margin at apex and a smaller one on either side toward eye and above margin, frontal sutures black. Female segment broadly excavated. Length 4.5-5 mm.

Common on coarse grasses and sedges in swampy areas of pasture land during August and September.

T. smithi Van Duzee.

Can. Ent., xxiv, 266, 1892.

Quite long and slender. Vertex broadly rounded. Yellow, with a broad black band on margin between eyes. Pronotum greenish, mottled with yellow. Elytra dull greenish, hyaline, posterior third smoky, veins distinctly visible. Female segment roundly produced, posterior margin shallowly emarginate. Length 5 mm.

A grass-feeding species found in open fields and especially on *Spartina michauxiana* in swampy pastures. Abundant during early summer and autumn.

New Haven, 25 June, 1921 (B. H. W.).

T. fitchii Van Duzee. (Fig. 10, 4.)

Ent. Amer., vi, 133, 1890.

Yellow to pale brown, vertex obtusely angled, four black spots just above margin, pronotum with about five longitudinal stripes. Elytra pale brownish, veins yellow. Female segment rounded either side to a median excavation forming a small notch either side of a broad median tooth. Length 4.5 mm.

Very common in swamps, wet meadows and pastures on coarse grasses throughout the summer.

New Haven, 27 July, 3 Oct., 4 July, 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.); East Haven, 29 July, 1921 (B. H. W.); Hamden, 25 Sept., 1921 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.).

T. nigrifrons (Forbes). *Cicadula nigrifrons* Forbes. *T. punctata* Van Duzee.

Rept. Ill. St. Ent., xiv, 67, 1884.

Vertex obtusely angled, yellow with a row of six black spots above margin continuing to extend over margin to front and before the eyes. Face usually black by coalescing arcs. Elytra tinged with green, often smoky. Length 5 mm.

Very abundant on grasses apparently more so in wet areas, but

has been taken on cultivated grasses and grains in upland areas and frequents pastures and meadows.

New Haven, 16, 21, 31 Oct., 4, 9 Nov., 1903 (H. L. V.); 22 June, 1912 (at light); 3 Oct., 1920 (B. H. W.); West Haven, 27 June, 1905 (H. L. V.); Wethersfield, 24 June, 1913 (L. B. R.); Bridgeport, 20 Sept., 1920 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Wilton, 19 Oct., 1920 (B. H. W.); North Haven, 24 Sept., 1921 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.).

T. inornatus Van Duzee.

Trans. Am. Ent. Soc., xix, 303, 1892.

Pale green to yellow, unmarked. Vertex strongly angled in front. Ocelli black, elytra greenish, hyaline. Female segment with posterior margin slightly waved or truncated. Length 5-5.5 mm.

Taken in large numbers from wild rye from June to September. A common *Calamagrostis* meadow species.

New Haven, 22 Sept., 1920, 9 July, 1921 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.).

T. placidus Osborn.

Rept. N. Y. St. Ent., xx, 536, 1905.

Orange-yellow, rather short and broad, head very blunt, scarcely angled, without definite markings. Female segment rather deeply and broadly excavated, a very broad short tooth at its apex. Length 5 mm.

A northern form feeding on coarse grasses in moist areas during August.

T. cypraceus Osborn.

Proc. Ia. Acad. Sci., v, 245, 1898.

Pale yellowish brown with reddish fuscous stripes. Vertex with four black transverse dashes on margin, a broad longitudinal fuscous band on vertex next either eye extending across pronotum to basal angles of scutellum, and a narrow one often more reddish from apex of vertex to disc of scutellum. Elytra fuscous with white veins. Length 5-5.5 mm.

Common in swamps on tall coarse sedges. Swept from *Scirpus-Cyperus* association, July, August and September.

Madison, 24 Sept., 1922 (B. H. W.).

Chlorotettix Van Duzee.

Vertex broad, usually broadly rounded or obtusely angled, a little longer at middle than next the eyes, vertex rounding to front without a definite margin. Elytra long, appendix well developed, venation obscure. Usually of a uniform green or yellowish green with few markings.

Key to Species.

1. Vertex with anterior margin rounded, usually broadly curved, the length at middle equaling or slightly exceeding length next the eyes

- Anterior margin of vertex distinctly but usually bluntly angulate,
at least one-third longer on the middle than next the eyes 5
2. General color lighter, pale green or yellowish 3
General color sordid green, usually very dark with brownish cast
tergatus
3. Female, last ventral segment notched but without spatulate process 4
Female, last ventral segment broadly notched, a broad spatulate
process extending backward from its apex. Male plates long
gradually tapering **spatulatus**
4. Size large, 7.5 mm., female segment evenly, somewhat concavely
and rather deeply notched, male plates long and produced .. **unicolor**
Size smaller, 6-7 mm., apple-green in color, female segment broadly
notched each side with a short blunt lateral tooth; male plates
very short, broadly rounded **viridius**
5. General color greenish, without color markings 6
Distinctly reddish brown in color, vertex with a transverse band
across middle between the eyes **lusorius**
6. Female segment notched, bearing a spatulate process at its apex,
length 7 mm. **balli**
Female segment without a spatulate process 7
7. Female segment with lateral lobes broad and rounded; male valve
broad and obtusely angled. Length 6 to 6.5 mm. **galbanatus**
Female segment black margined, notched at center; broadly
shallowly, emarginate either side; male valve rather narrow,
and rounded. Length 7.5 mm. **nudatus**

C. unicolor (Fitch). *Bythoscopus unicolor* Fitch. (Fig. 10, 3.)

Homop. N. Y. St. Cab., 58, 1851.

Large, uniformly green without definite markings. Vertex well rounded in front, two and one-half times as broad as long. Female segment rather long, broadly and shallowly notched. Length 7.5 mm.

Common in the north and throughout New England on Blue-grass and allied grasses in pastures and meadows throughout the summer.

New Haven, 20, 24 June, 1902 (E. J. S. M.); 3 Oct., 1902 (B. H. W.); 16 Oct., 1903 (H. L. V.); 11, 16, 20, 27, 31 July, 8, 22 Aug., 1920 (B. H. W.); West Haven, 27 June, 1905 (H. L. V.); East Hartford, 13 Aug., 1906 (B. H. W.); Yalesville, 16 Oct., 1906 (W. E. B.); Hamden, 18, 24 July, 1920 (B. H. W.); East Haven, 21 July, 1920 (B. H. W.); Danbury, 29 Aug., 1920 (B. H. W.); Branford, 21 July, 1920 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Guilford, 24 July, 1921 (B. H. W.); North Branford, 5 July, 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.).

C. spatulatus Osborn and Ball.

Proc. Ia. Acad. Sci., iv, 225, 1897.

In general appearance resembling *unicolor* but usually a more yellowish green, uniformly colored and without markings. Head well rounded before. Female segment deeply excavated, bearing a long spatulate process at the apex. Length 7 mm.

Often found in company with *unicolor*, in grassy pastures and meadows. It resembles so closely in size and color this species that they are easily confused in the field.

New Haven, 23 July, 1921 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.).

C. tergatus (Fitch). *Bythoscopus tergatus* Fitch.

Homop. N. Y. St. Cab., 58, 1851.

Size and form of *unicolor* but with a dark sordid green color, elytra smoky. Head broadly rounded on anterior margin. Female segment with a broad V-shaped notch extending half way to the base, lateral lobes rounded. Length 7 mm.

Common on grasses in moist areas during July, August and September.

Salisbury, 30 Aug., 1904 (W. E. B.); Cornwall, 10 Aug., 1918 (B. H. W.); Kent, 10 Aug., 1918 (M. P. Z.); New Haven, 22 Sept., 1918 (F. H. L.); 16, 27 July, 3 Aug., 1920 (B. H. W.); Durham, 10 Aug., 1922 (M. P. Z.); East Hartford, 13 Aug., 1906 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); also from Branford without specific date.

C. viridius Van Duzee.

Psyche, vi, 309, 1892.

With rounded vertex, but smaller than allied round-headed species, and with a uniform apple-green color. Female segment broadly excavated almost to base, each side of incisure bearing a short obtuse tooth at middle. Male plates triangular and transverse. Length 6-7 mm.

A common pasture species throughout the southern states and often occurs in small numbers in the north.

Guilford, 24 July, 1921 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.); Milford (George Dimmock).

C. galbanatus Van Duzee.

Psyche, vi, 310, 1892.

Yellowish green with obtusely angled vertex, a half longer at middle than next the eyes. Female segment long, a rather broad lingulate incisure reaches nearly to base forming a broad, rounded lobe either side. Length 6-6.5 mm.

A common pasture and meadow species throughout New England, June to September.

West Haven, 27 June, New Haven, 4 July, 1905 (H. L. V.); 27 June, 1908 (W. E. B.); 22 Sept., 1918 (F. H. L.); 31 July, 8 Aug., 22 Sept., 1920 (B. H. W.); New Canaan, 22 Sept., 1910 (W. E. B.); Bridgeport, 20 Sept., 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); North Branford, 13 July, 1920 (B. H. W.); Hamden, 5 July, 1920 (P. G.); Marlborough, 15 July, 1922 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); Windham, 3 Aug., 1922 (B. H. W.).

C. balli Osborn.

Proc. Ia. Acad. Sci., v, 246, 1898.

Easily distinguished from all others by the obtusely angled head and the female spatulate process. Vertex one-half longer on middle than next eyes. Uniform yellowish green without markings. Female segment notched and bearing a spatulate process. Length 7-7.25 mm.

Usually occurs in more abundance in sheltered areas on grasses, but has frequently been taken in open fields.

Winnipauk, 4 Aug., 1908 (C. W. J.).

C. lusorius (Osborn and Ball).

Proc. Ia. Acad. Sci., iv, 226, 1897.

Vertex one-half longer on middle than at eyes. Olive-brown with a faint crescentiform band between eyes. Brownish tinged with red, especially on elytra. Female segment emarginate posteriorly, with a broad, angular, dark-margined median tooth half as long as acutely rounding lateral angles. Length 7-8 mm.

Found on coarse grasses during July and August, but always in open woods or sheltered areas. From collecting observations it seems to be a woodland species.

New Haven, 30 July, 1909 (B. H. W.); 22 Sept., 1918 (D. M. D.); 20 July, 1920 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); North Banford, 13 July, 1920 (B. H. W.); Portland, 25 Aug., 1920 (B. H. W.); Cornwall, 10 Aug., 1918 (B. H. W.); Hamden, 25 Sept., 1921 (B. H. W.); North Haven, 6 Aug., 1922 (B. H. W.).

C. nudatus Ball.

Can. Ent., 32, 340, 1900.

A large species of the genus with vertex twice longer on middle than next the eyes. Pale green with some brownish areas on pronotum, scutellum and elytra. Female last ventral segment with posterior border dark margined, a notch at center and a shallow emargination either side divides the segment into four lobes. Lateral angles prominent. Male valve narrow, roundly angulate; plates broad at base, three times the length of the valve, gradually narrowed to acute, slightly produced tips.

A grass-feeding species with a southern distribution. The collecting of this species in Connecticut establishes a very interesting and unique record. It is apparently distributed along the Atlantic coastal area.

Windham, 3 Aug., 1922 (B. H. W.).

Jassus Fabricius.

Coelidia Germar.

Deridna Walker.

Head narrower than pronotum, vertex broadly curved, quadrate, rounding to front. Pronotum very short, emarginate posteriorly, scutellum large, triangular, very wide at base. Apex of elytra broadly rounded.

J. olitorius Say. (Fig. 10, 8 and 15.)

Jour. Acad. Nat. Sci., Phila., vi, 310, 1831.

Head blunt and rounded, vertex yellow, pronotum brownish, a dark stripe on either side of a median pale stripe. Basal angles of scutellum and two spots on disc black. Elytra brown, a pale band before middle of clavus and one across apex of anteapical cells. Male with pronotum, scutellum and elytra darker than in female. Length, male 6 mm., female 7.5 mm.

A shrub-feeding species often collected from sassafras during July, August and September.

New Haven, 5 Aug., 1904; 21 Aug., 1906; 28 Aug., 1908 (B. H. W.); 30 Aug., 1909, 7 Sept., 1910 (W. E. B.); 3 Aug., 1909 (A. I. B.); 28 Aug., 1913 (L. B. R.); 5 Aug., 1920 (B. H. W.); East Hartford, 13 Aug., 1906 (B. H. W.); Westville, 9 Sept., 1907 (W. E. B.); Lyme, 20 Aug., 1910 (B. H. W.); Wallingford, 27 Aug., 1910 (D. J. C.); Hartford, 16 Aug., 1911, Stamford, 16 Aug., 1912 (W. E. B.); Portland, 12 Aug., 1913 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Cornwall, 23 Aug., 1920 (K. F. C.); Hamden, 6 Aug., 1922 (B. H. W.); Kent, 10 Aug., 1918 (B. H. W.); North Branford, 1 Aug., 1922 (B. H. W.); North Haven, 6 Aug. (B. H. W.).

Neocoelidia Gillette and Baker.

Short and robust, head narrower than pronotum, short, rather bluntly conical. Pronotum short and broad, scutellum large. Elytra broad with four apical cells, appendix wanting, first sector branched once on apical two-thirds.

N. tumidifrons Gillette and Baker. (Fig. 10, 14.)

Hemip. Col., 104, 1895.

Robust, uniformly pale yellowish or greenish, often tinged with orange. Basal angles of scutellum usually with black spots. Length 3.5-4.5 mm.

Lives in pastures and grassy areas where it is swampy or very moist during June, July and August.

North Branford, 12 June, 1921, 16 June, 1922 (B. H. W.).

Paracoelidea Baker.

With about the same characters as found in the preceding genus, but the clypeus here is tuberculate and the wings are long as in *Thamnotettix*. One species has been described in this genus.

P. tuberculata Baker.

Can. Ent., xxx, 292, 1898.

Vertex produced and subacute, yellowish, elytra subhyaline with internal margin and apex slightly infuscated. Female segment truncated. Male valves long, tapering, plates obtuse at tips. Length 5 mm.

Common on pine in New England. Massachusetts is cited as a type locality, and since it occurs on Long Island and in New Jersey will undoubtedly be found on pines at intervening points.

Cicadula Zetterstedt.

Macrosteles Fieber.

Thamnus Fieber.

Limotettix Sahlberg.

Vertex slightly obtusely angled or rounded at apex, longer on middle than next eyes and rounding to front. Elytra exceeding

abdomen, with distinct appendix, outer branch of first sector usually wanting.

Most of the species which belong here have two broods with perhaps a partial third. With the exception of one or two which are shrub-feeders, they apparently feed almost exclusively on herbaceous plants. A few are common on *Juncus*, one or two feed on *Impatiens* and others apparently live on grasses and sedges and seem to prefer moist habitats.

Key to Species.

1. Small, less than 5 mm. in length, usually with several markings on vertex 2
Larger, more than 5 mm. in length, vertex with two large black spots close to margin, a pair in basal angles of scutellum, elytra usually with a striped appearance **punctifrons**
2. Species average size 4-5 mm. 3
Species minute less than 3 mm. 6
3. Vertex with four or six black marks on or above margin 4
Vertex with only two round black spots located just above margin, usually an arcuate band on pronotum, parallel to and just back of the margin **arcuata**
4. Vertex with two round black spots on margin and two round spots close to base 5
Vertex with six marks in pairs, usually a pair of transverse spots or dashes on margin, a pair just above margin, and a pair of round ones near base **sex-notata**
5. With only four spots on vertex, elytra extremely variable in coloration, usually with dark blotches. (Fig. 10, 10 and 13.) **variata**
With four spots and an additional small one on the margin next either eye **lepida**
6. Vertex yellow with six or more spots often partially fused. A pair of black spots in angles of scutellum, elytra mottled **slossoni**
Vertex dark fuscous with yellow markings, scutellum dark on disc, yellow margined **potoria**

C. punctifrons (Fallen). *Cicada punctifrons* Fallen.

Hemip. Suec. Cicad., 42, 1826.

Larger than the other species, pale greenish yellow with two large black spots on vertex just back of margin, nearer to eyes than median line. Tips of elytra slightly infuscated. Often swept from willows on which it no doubt feeds. Common from June to September. Length 6 mm.

C. punctifrons var. **repleta** Fieber. *C. punctifrons* var. *americana* Van Duzee.

Revue d'Ent., iv, 49, 1885.

As in preceding but with more coloration. Face and disc of pronotum infuscated, basal angles of pronotum each with a large black spot. Inner half of elytra dark with pale veins, giving it an obliquely striped appearance. Length 5.5-6 mm.

C. variata (Fallen). *Cicada variata* Fallen. *Jassus fumatus* Herrich-Schaeffer. (Fig. 10, 10 and 13.)

Acta Holm, xxvii, 34, 1806.

Head produced but with apex rounded and varying extremely in color. Always with four black spots on vertex, two large ones on margin and two usually smaller behind on disc, one either side of median line. Pronotum and elytra usually mottled but varying to a uniform black in extreme cases. Scutellum yellow, basal angles black. Length 4 mm.

A common and abundant species occurring on *Impatiens* in moist habitats throughout the summer.

Bridgeport, 20 Sept., 1920 (B. H. W.), on *Impatiens*; New Haven, 22 Aug., 1920 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

C. lepida Van Duzee.

Can. Ent., xxvi, 139, 1894.

Resembling *variata* with two black spots on margin and two on disc of vertex, but with an additional spot next either eye on margin. Elytra usually greenish or slightly mottled. Length 3.5-4 mm.

Often found with the preceding on *Impatiens* in very moist, usually wooded areas, where this plant is found in abundance, June to September.

New Haven, 3 Oct., 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.), on *Impatiens*; Orange, 17 July, 1920 (B. H. W.); Hamden, 6 Aug., 1922 (B. H. W.); Fairfield, 26 Aug., 1920 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.); North Branford, 2 June, 1921 (B. H. W.).

C. arcuata Gillette and Baker.

Hemip. Col., 105, 1895.

Vertex produced and rounded at apex, yellowish, two large black spots above margin nearer eyes than apex. Pronotum with an arcuate, black line nearly parallel to anterior margin. Elytra pale greenish hyaline, nervures yellow. Length 4.5-4.75 mm.

Feeds on herbaceous vegetation. No definite food plant is known apparently. It is doubtful whether this species occurs in New England, but is reported for New York.

C. sexnotata (Fallen). *Cicada sexnotata* Fallen. *C. quadri lineata* Forbes. (Fig. 9, 10.)

Acta Holm, xxvii, 34, 1906.

Vertex produced but rounded at apex, always marked with six more or less distinct black spots. A pair of transverse ones on margin, another pair transverse above these and between eyes, and a pair of small round ones near base. Basal angles of scutellum often marked with black. Elytra green, smoky at apices, venation paler. Length 4 mm.

A cosmopolitan feeder taken usually on herbaceous plants and common on grasses in pastures and meadows throughout the summer. It is often a pest on cultivated grasses and truck crops.

New Haven, 16, 19, 21 Oct., 9 Nov., 1903 (H. L. V.); 6 June, 1916 (B. H. W.); 10, 14 June, 7, 20, 29 July, 22 Sept., 3 Oct., 1920 (B. H. W.); Cromwell, 27 Aug., 1920 (B. H. W.); Branford, 20 July, 1905 (H. W. W.);

21 July, 1920 (B. H. W.); East River, 10 July, 1909 (C. R. E.); Yalesville, 19 Oct., 1903 (H. L. V.); Bridgeport, 20 Sept., 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); New Canaan, 3 Sept., 1920 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Madison, 24 Sept., 1922 (B. H. W.); Orange, 2 June, 1920 (W. E. B.); North Haven, 24 Sept., 1921 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.).

C. slossoni Van Duzee.

Can. Ent., xxv, 281, 1893.

A small robust species with blunt head. Arcs on front, a pair of transverse spots at margin and two pairs irregular in shape above these, black. These are often fused on vertex, causing an almost black coloration. Scutellum with disc and basal angles marked with black. Elytra mottled. Length 2.5-3 mm.

Common on *Juncus* in wet pastures, but apparently occurs only in this habitat.

New Haven, 20 Aug., 1920 (B. H. W.); North Branford, 12 June, 1921 (B. H. W.).

C. pоторia Ball.

Can. Ent., xxxii, 346, 1900.

Vertex nearly right-angled, apex conical, dark fuscous, the margins a median line and two dashes on either side, yellow. Pronotum and scutellum fuscous, yellow-margined, elytra long milky subhyaline sometimes mottled. Length 2.2-2.5 mm.

A swamp or wet pasture species feeding on *Juncus* and *Eleocharis* and always found in a restricted habitat.

Balclutha Kirkaldy.

Elongate, slender, vertex very short, almost parallel margined, obtuse and rounded before. Head not wider than pronotum, usually narrower and pronotum strongly produced and rounded forward from humeral angles, concave posteriorly. Elytra greatly exceeding abdomen with a well-defined appendix, and the outer branch of the first sector wanting.

Key to Species.

1. Elytra without markings, colored some shade of green or yellow 2
Elytra marked with black spots or irregular blotches **punctata**
2. Robust bright green. Length 4 mm. **osborni**
Smaller, 3.5 mm. in length, dull or pale green, often with elytra
whitish **impicta**

B. punctata (Thunberg). *Cicada punctata* Thunberg. *Eupteryx clypeata* Curtis. *Cicadula spreta* Zetterstedt. *Typhlocyba rosea* Provancher. *Typhlocyba jacosa* Provancher.

Acta Upsala, iv, 21, 1782.

Vertex obtusely produced in front, dull green, yellow or tinted with red. Vertex, pronotum and scutellum often marked with black or fuscous in the form of longitudinal lines. Elytra with black spots arranged in two oblique bands. Length 3.5-4 mm.

Very common on herbaceous vegetation in pastures, meadows and undergrowth in woodland areas.

New Haven, 16 Oct., 1903 (H. L. V.); 1 June, 1911 (B. H. W.); 22 Sept., 1918 (D. M. D.); 20 May, 1920 (B. H. W.); Yalesville, 19 Oct., 1903 (H. L. V.); Bridgeport, 20 Sept., 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.); Killingworth, 31 May, 1920 (B. H. W.); North Branford, 30 May, 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.); Milford, 2 May, 1921 (B. H. W.); Plainville, 2 Sept., 1921 (B. H. W.).

B. osborni Van Duzee. *Gnathodus viridis* Osborn.

Check List Hemip., 75, 1916; N. Y. St. Ent., xx, 541, 1905.

A moderately large green species resembling closely green specimens of *punctatus* but without dark markings. Vertex a little produced and obtuse. Deep green, vertex and scutellum often yellowish, elytra pale hyaline, nervures dark green to clavus, apex smoky. Length 3.5-4 mm.

Common on grasses in pastures and meadows. Apparently prefers moist areas.

New Haven, 18, 29, 31 July, 1920 (B. H. W.); Hamden, 6 Aug., 1922 (B. H. W.).

B. impicta (Van Duzee). *Gnathodus impictus* Van Duzee. (Fig. 9, 9; Fig. 10, 11.)

Can. Ent., xxiv, 113, 1892.

Dull green to gray, often with a smoky tint. Head and pronotum usually tinted with green or fuscous, elytra whitish or smoky, subhyaline, nervures indistinct. Head very blunt and rounded, narrower than pronotum. Length 3.5 mm.

Common in pastures and meadows throughout the summer and occurs abundantly in New England.

Reported from Connecticut without specific data.

Eugnathodus Baker.

Vertex not produced, almost transverse and parallel margined, wider than pronotum which is truncated or slightly convex posteriorly and broadly gently curved in front. Elytra with appendix distinct, and outer branch of first sector wanting.

E. abdominalis (Van Duzee). *Gnathodus abdominalis* Van Duzee. (Fig. 10, 12.)

Can. Ent., xxiv, 113, 1892.

Vertex rounded, parallel margined, scarcely produced before eyes. Greenish white, pronotum and scutellum often tinged with fuscous or marked with longitudinal lines. Elytra whitish, subhyaline often smoky at apex. Length 3 mm.

A pasture and meadow form, sometimes swept from shrubs. Common and abundant over large areas and easily confused with the *Typhlocybini* because of its fragile character.

Hamden, 23 Oct., 1921 (B. H. W.); North Haven, 24 Sept., 1921 (B. H. W.).

Tribe **TYPHLOCYBINI.****Eupteryginae.**

The chief characters which separate this group are used in the preceding key. The frequent absence of the ocelli and the unbranched condition of the sectors which extends to the apical cells before dividing or giving off cross nervures, so that no anteapical cells are formed, are characteristic of the following species.

Although this group is composed of the smallest and most fragile of the entire family, it contains some of greatest economic importance which are known for their damage from coast to coast.

Key to Genera.

1. Posterior wings with sectors ending in a marginal vein. (Fig. 14, 1b, 3b, 4a.) 2
Posterior wings without marginal vein, sectors extending to wing margin. (Fig. 14, 5c, 6b, 7b.) 4
2. Elytra with well-defined appendix. (Fig. 14, 1c.) **Alebra**, p. 147
Elytra without appendix. (Fig. 14, 3c, 4b.) 3
3. Posterior wing with two apical cells. (Fig. 14, 3b.) **Dikraneura**, p. 148
Posterior wing with one apical cell. (Fig. 14, 4a.) **Empoasca**, p. 151
4. First two sectors of posterior wing uniting so that only three veins extend to wing margin. (Fig. 14, 6b, 7b.) 5
Posterior wing with all four sectors ending in the wing margins. (Fig. 14, 5c.) **Typhlocyba**, p. 155
5. Elytra with outer sector not uniting in any part with middle sector; a common cross vein between them forming base of oblong apical cell. (Fig. 14, 6a.) **Erythroneura**, p. 159
Elytra with outer and middle sectors uniting for a short distance, posterior to cross veins, thus forming a triangular apical cell. (Fig. 14, 7a.) **Empoa**, p. 157

Alebra Fieber.

Characterized by the blunt feebly curved, parallel-margined head, which is narrower than pronotum, the elytra with a distinct appendix and the wing with a marginal vein.

Key to Species.

1. Entirely orange-yellow or white with yellowish elytral suture, without dark markings **albostriella**
Dark in color or pale with dark markings 2
 2. White to yellow, a brownish area on tip of clavus and scutellum and disc of pronotum brownish **albostriella** var. **wahlbergi**
Deep smoky to black, especially clavus and tips of elytra dark, face yellowish **fumidus**
- A. albostriella** (Fallen). *Cicada albostriella* Fallen. *Cicada elegantula* Zetterstedt. *Typhlocyba pallidula* Walsh. (Fig. 14, 1a, b, c.)

Hemip. Succ., Cicad., 54, 1826.

Head blunt, rounded and parallel-margined, white or pale yellow, often with a yellow stripe along suture. Tarsi black and tips of elytra smoky. Length 4 mm.

More often found on shrubs, but sometimes taken from herbaceous plants. It is usually present in good numbers on linden.

New Haven, 4 Aug., 1920 (B. H. W.).

A. albostriella var. **fulveola** (Herrich-Schaeffer). *Typhlocyba aurea* Walsh.

Fauna Germ., cxiv, No. 16, 1839.

Many of the preceding are a uniform orange-yellow in color, and are placed under this varietal name.

Occurs with the preceding.

New Haven, 26 June, 8 July, 1912 (at light); Hamden, 29 June, 1913 (B. H. W.) (on linden); 5 July, 1910 (B. H. W.); North Branford, 1 Aug., 1922 (B. H. W.); Ellington, 8 Aug., 1922 (B. H. W.).

A. albostriella var. **wahlbergi** Boheman.

Hemip. Homop., Br. Ids., 193, 1896.

Whitish elytra with a stripe along suture, one in brachial area and another along costa yellow. Disc of pronotum, scutellum and an irregular blotch on tip of clavus brownish.

The capturing of this species in Connecticut is a new American record. It is common in Europe on elm.

New Haven, July 5, 1920 (B. H. W.) on elm.

A. fumida Gillette.

Proc. U. S. Nat. Mus., xx, 714, 1898.

A dark smoky color above often intermingled with yellow. Face yellow, smoky at base. Elytra darkest on clavus and at tips. Length 3.75 mm.

No doubt is a shrub species as it has been taken only in sweepings from shrubs or undergrowth close to them, and occurs in small numbers.

Cornwall, 18 July, 1921 (B. H. W.); on *Crataegus*.

Dikraneura Hardy.

Chloroneura Walsh.

Form long and slender, vertex produced, usually angled, elytra without appendix, wing with submarginal nerve complete.

Most of these are pasture forms, and they occur often in great numbers. One or two species have been found on shrubs and possibly feed on these.

Key to Species.

1. Elytra with apical cell on costal margin lanceolate or wanting, elytra usually yellowish or greenish with more angulate vertex ... 2
Elytra with a deep triangular cell on apical margin; milky white, always with a smoky cross vein and often with red dashes on clavus and inner corium **cruentata**
2. Species with elytra greenish or whitish, vertex rather sharply angled. (Fig. 14, 2.) 3
Species with elytra yellowish, vertex bluntly angled. (Fig. 14, 3a.) 4

3. Broad and robust, vertex broad, elytra whitish, nervure indistinct. *.mali*
Long and very narrow, vertex very pointed, elytra greenish or above
abdomen a bluish cast, head pronotum and scutellum yellowish *abnormis*
4. Uniform deep yellow, abdomen above black, vertex uniform yellow-
ish *flavipennis*
With pale yellow color, vertex usually with a distinct orange tinge
on margin *fieberi*

D. cruentata Gillette.

Proc. U. S. Nat. Mus., xx, 717, 1898.

Vertex produced, apex moderately rounded, yellow, often with a sanguineous blotch on middle, two lines on pronotum, scutellum sanguineous, a blotch on clavus and another along inner sector of corium. Red coloration frequently absent, but with elytron smoky on cross veins. Length 2.75 mm.

Has been reported from alder and witchhazel as adult in early spring and late summer.

D. mali (Provancher). *Erythroneura mali* Provancher. *Dikraneura communis* Gillette.

Pet. Faune Ent. Can., iii, 298, 1890.

Rather large, head produced, blunt but angled, sordid milky white; vertex, pronotum and scutellum tinged with yellow, no distinct markings above. Length 3.75 mm.

A grass- and grain-feeding species, and one of our common pasture and meadow pests throughout spring and summer.

West Haven, 11 May, 1905 (B. H. W.); New Haven, 22 Sept., 1918 (F. H. L.); 24 May, 1920 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Westbrook, 21 Sept., 1920 (B. H. W.); Hamden, 10 Apr., 1921 (B. H. W.); Milford, 2 May, 1921 (M. P. Z.); Madison, 24 Sept., 1922 (B. H. W.).

D. abnormis (Walsh). *Chloroneura abnormis* Walsh. (Fig. 14, 2.)

Proc. Bost. Soc. Nat. Hist., ix, 316, 1864.

Long and very narrow, head produced, pointed but tip slightly rounded. Pale green often with two longitudinal sanguineous lines crossing vertex and pronotum. Elytra subhyaline at tips, an obscure red stripe on costa and another parallel to it half way to costa. Length 3.5 mm.

A grass feeder and occasionally found in large numbers injuring grain.

North Branford, 12 June, 1921 (B. H. W.).

D. flavipennis (Zetterstedt). *Cicada flavipennis* Zetterstedt. *D. armata* Buckton.

Fauna Lapp., 292, 1828.

Vertex roundly angled, color yellowish unmarked. Abdomen dark, margins yellow, elytra deep yellow, apex whitish hyaline, hind tibiae with a row of distinct black spots. Length 3.75 mm.

A pasture species which may occur in Connecticut.

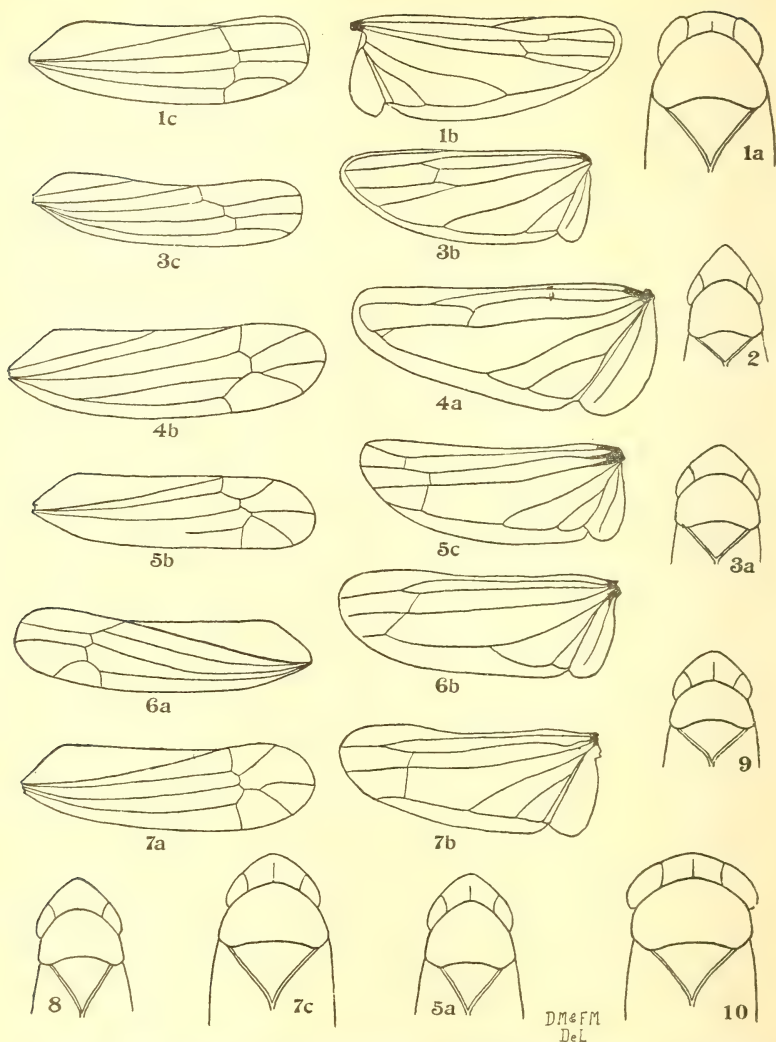


FIG. 14. (1a) *Alebra albostriella* Fallen,—head, dorsal view; (1b) same, wing; (1c) same, elytron. (2) *Dikraneura abnormis* Walsh,—head, dorsal view. (3a) *Dikraneura fieberi* Loew,—head, dorsal view; (3b) same, wing; (3c) same, elytron. (4a) *Empoasca obtusa* Walsh,—wing; (4b) same, elytron. (5a) *Typhlocyba flavoscuta* Gillette,—head, dorsal view; (5b) same, elytron; (5c) same, wing. (6a) *Erythroneura obliqua* Say,—elytron; (6b) same, wing. (7a) *Empoa querci* var. *gillettei* Van Duzee,—elytron; (7b) same, wing; (7c) same, head, dorsal view. (8) *Erythroneura tricincta* Fitch,—head, dorsal view. (9) *Empoasca flavescens* Fabricius,—head, dorsal view. (10) *Empoasca trifasciata* Gillette,—head, dorsal view. All greatly enlarged, Drawing by D. M. and F. M. DeLong.

D. fieberi (Loew). *Notus fieberi* Loew. (Fig. 14, 3a, b, c.)

Kat. Ostr. Cicad., 39, 1886.

Vertex produced obtuse and rounded, yellowish with apex of vertex and base of front rather uniformly washed or spotted with orange-red. This conspicuous marking will distinguish it from others of the genus. Length 3.5 mm.

A very common form throughout the summer in pastures and meadows injuring grasses. It usually occurs in such numbers as to cause severe injury.

New Haven, 24 May, 10, 14 June, 11, 16 July, 8 Aug., 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.); Branford, 21 July, 1920; East Haven, 21 July, 1920 (B. H. W.).

Empoasca Walsh.

Chlorita Fieber.

Cybus Douglas.

Kybos Fieber.

Vertex varying from slightly produced and broadly rounding to well produced and strongly rounded, or even obtusely angled. The posterior wing with a marginal vein, one apical cell, and second apical area elongate. Species small, some shade of green, usually marked with yellow, white or red.

The members of this genus are diverse in feeding habits, and while some are always found on trees or shrubs, others are found only on herbaceous plants. Most of these species occur throughout the growing season and are serious pests of fruit, grain, pasture grasses and garden crops.

Key to Species.

1. Vertex not produced or very slightly so, usually well rounded. (Fig. 14, 10.) 2
Vertex distinctly produced, often obtusely angled. (Fig. 14, 9.) 9
2. Elytra green with black or dark markings in form of stripes or bands 3
Elytra green without dark markings in form of bands 4
3. With three transverse dark bands, one on pronotum and two on elytra *trifasciata*
With dark stripe along elytral suture, extending upon pronotum *smaragdula*
Vertex distinctly produced, often obtusely angled. (Fig. 14, 9.) 9
4. Last ventral segment of female produced and without incisions, or notched only on sides of produced segment 5
Last ventral segment of female notched at middle 7
5. Robust, green unicolorous or without dark markings 6
Deep green, claval suture blue, a black spot before cross veins, vertex pronotum, and elytra marked with reddish orange *unica*
6. Sides of last ventral segment of female incised or notched, vertex evenly rounded and with yellowish markings, length 5 mm. *aureoviridis*

- Sides of last ventral segment of female produced but not notched or incised, vertex distinctly but slightly produced, green unicolorous, scarcely more than 4 mm. *obtusa*
7. Female segment with a broad shallow notch the base of which is a broad blunt tooth 8
 Female segment with a broad U-shaped notch without a tooth, a black spot near apex of elytra *pergandei*
8. Tooth long, species greenish without dark markings on elytra *unicolor*
 Tooth much shorter, elytra striped with orange-red and with black spot before cross veins *atrolabes*
9. Face and vertex not red 10
 Face and margin of vertex a dark rather bright red *coccinea*
10. Elytra greenish or yellowish, not banded 11
 Elytra greenish, slightly smoky with a darker band across center *birdii*
11. Pale green, nervures not conspicuous 12
 Darker green, line on pronotum and veins of elytra conspicuously pale, tip of elytra smoky *alboneura*
12. Face almost as broad as long 13
 Face one-third longer than broad *viridescens*
13. Pronotum with six or eight white spots along anterior margin ... *mali*
 Pronotum with three white spots or none on anterior margin *flavescens*

E. trifasciata Gillette. (Fig. 14, 10.)

Proc. U. S. Nat. Mus., xx, 726, 1898.

Vertex well rounded in front, color green, vertex and pronotum marked with reddish or golden yellow. A broad black band across posterior half of pronotum, another across middle of elytra and a broader one at apex. Length 4 mm.

A common species but usually found only on cottonwood both as nymph and adult.

Durham, 27 Aug., 1920 (B. H. W.); Norwalk, 8 Sept., 1920 (B. H. W.). On poplar; Portland, 25 June, 1922 (M. P. Z.).

E. smaragdula (Fallen). *Cicada smaragdula* Fallen. *Eupteryx viridipes* Curtis.

Acta Holm, 37, 1806.

Vertex slightly produced, color green, a broad black stripe extending from disc of pronotum across scutellum then along elytral suture and terminating in a larger black area at apex. Length 3.5-4 mm.

Reported from willows and *Crataegus*, but seems to occur in greater numbers on the former during July and August.

East Hartford, 16 Sept., 1920 (B. H. W.); New Haven, 1, 3 Aug., 3 Oct., 1920 (B. H. W.). On willows.

E. unicolor Gillette.

Proc. U. S. Nat. Mus., xx, 731, 1898.

Vertex broadly rounded, color yellow to green, usually with a pale median stripe and a bluish blotch next each eye. Female segment rounded, with an oblique notch either side of a median blunt tooth. Length 3.5 mm.

In some sections this is a severe pest of apple foliage, and is found in company with *E. mali* and *Empoia rosae*.

Portland, 24 July, 1921 (B. H. W.), on poplar.

E. obtusa Walsh. (Fig. 14, 4a, b.)

Proc. Bost. Soc. Nat. Hist., ix, 316, 1864.

Resembling *unicolor*, vertex obtusely rounded not strongly produced, greenish with tips of elytra hyaline. Female segment produced but without notch. Length 4 mm.

Common on willows in early spring and summer.

New Haven, 8 Aug., 1920 (B. H. W.), on *Salix*; 18 July, 3 Oct., 1920 (B. H. W.); Orange, 17 July, 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.).

E. aureoviridis (Uhler). *Typhlocyba aureoviridis* Uhler.

Bull. U. S. Geol. Geog. Surv., iii, 474, 1877.

More robust than *obtusa* with a more rounded and less produced vertex. Color yellowish green to golden yellow, a pale spot behind each eye on pronotum, often a median line extending across scutellum. Female segment strongly produced and notched or slightly incised on either side. Length 5 mm.

A common willow species and rather widely distributed.

New Haven, 3 Oct., 1920 (B. H. W.).

E. unica (Provancher). *Typhlocyba unica* Provancher. *E. splendida* Gillette.

Pet. Faune Ent. Can., iii, 340, 1890.

Vertex slightly produced, orange-yellow anteriorly, deep blue posteriorly. Pronotum reddish orange anteriorly, and bluish posteriorly. Elytra reddish with a rather broad blue stripe along claval and costal veins, apex smoky subhyaline, a black spot before cross nervure of apical cell. Length 3.5 mm.

Common on alder which is its food plant.

New Haven, 20 July, 1911 (A. B. C.); 22 Sept., 1918 (D. M. D.); 4, 7, 8, 9 July, 1 Aug., 22 Sept., 1920 (B. H. W.); Portland, 8 Aug., 1913 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.); Hamden, 5 July, 1920 (P. G.).

E. atrolabes Gillette.

Proc. U. S. Nat. Mus., xx, 736, 1898.

Similar to *unica* with duller colors, greenish golden marked with blue, segment bearing a square, abrupt notch. Elytra marked as in *unica* and with black spot before cross nervures. Length 3.5 mm.

Found on alder throughout the summer in company with the preceding.

New Haven, 3 July, 1920 (B. H. W.).

E. pergandei Gillette.

Vertex rounded, not produced, pale yellowish green, pronotum with whitish mottling and a broad white line on scutellum, a black spot on each elytron before cross nervure of inner apical cell. Female segment with a rather broad, gradually sloping U-shaped notch. Length 3.75 mm.

Perhaps this feeds on herbaceous vegetation, as it has been taken in general sweeping in open areas.

New Haven, 4 July, 1920 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.).

E. coccinea (Fitch). *Empoa coccinea* Fitch.

Rather small, vertex blunt, strongly rounded. Vertex, pronotum, scutellum and face to apex of clypeus, a bright, deep red. Elytra smoky subhyaline, costal vein greenish. Very conspicuously marked. Length 3 mm.

Recorded from pine by Dr. Fitch; although no other collector has designated where it was taken the species is more often found in areas where pines are abundant, and this may prove to be its food plant.

E. alboneura Gillette.

Proc. U. S. Nat. Mus., xx, 743, 1898.

Small robust, vertex somewhat produced and pointed in front. Pale green, a longitudinal pale line across vertex, pronotum, and scutellum. Elytra with tips smoky, and all the nervures pale. Length 3 mm.

From collecting records it would seem that this little species is able to feed both on shrub and herbaceous plants.

E. mali (LeBaron). *Tettigonia mali* LeBaron. *Empoa albopicta* Forbes. Apple Leaf-hopper.

Prairie Farmer, xiii, 330, 1853.

Vertex produced, obtusely angled. Greenish to yellow with a row of six to eight white spots on anterior margin of pronotum. Length 3.25 mm.

A cosmopolitan feeder being a pest of apple, alfalfa, grain and truck crops, and attributed with the carrying of fungus diseases. One of our most important pests.

New Haven, 16, 31 Oct., 1903 (H. L. V.); Cornwall, 18 July, 1921 (B. H. W.); Ellington, 8 Aug., 1922 (B. H. W.), on apple; Hamden, 14 July, 1921 (P. G.), on potato.

E. flavescens (Fabricius). *Cicada flavescens* Fabricius. (Fig. 14, 9.)

Ent. Syst., iv, 46, 1794.

Resembling *mali* in size, form and color, but with three white spots or none on anterior margin of pronotum. Color bright green to yellow. Length 3.25 mm.

It occupies about the same economic position as the preceding, and is found to feed on the same types of vegetation.

New Haven, 10, 14 June, 31 July, 22 Sept., 30 Oct., 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.).

E. viridescens Walsh. *E. consobrina* Walsh.

Proc. Bost. Soc. Nat. Hist., ix, 316, 1864.

Vertex produced and rounded at apex, elytra subhyaline with a

faint greenish tinge. Face with a pale line on middle, another on middle of vertex, and one on middle of scutellum. Three spots on anterior margin of pronotum white. Length 3 mm.

Perhaps very closely related to the two preceding and occurring on herbaceous plants.

E. birdii Goding.

Ent. News, i, 123, 1890.

Vertex obtusely rounded in front, color yellow to green, a pale stripe extending across vertex and pronotum, and often scutellum. A pale spot either side of this on base of vertex and anterior portion of pronotum. Elytra yellow smoky crossed by a darker band at middle, sometimes fused with a dark area at base of clavus, and a spot at apex darker. Length 3 mm.

Occurs on a number of plants and shrubs, not an abundant species.

Typhlocyba Germar.

Eupteryx Curtis.

Elongate, slender, vertex crescent-shaped, elytra exceeding abdomen, appendix wanting. Wings without marginal vein, all four veins extending to wing margin, not fused.

Only a few American species belong here and feed upon plants which, for the most part, are not of economic importance.

Key to Species.

- 1. Milky white, elytra rounded on outer apical margin and concavely truncate toward inner margin, with radiating brown lines on posterior half**inscripta**
Dark in color or marked with black spots, elytra convexly rounded posteriorly 2
- 2. Usually brown or black in color, vertex almost uniform in color, without spots 3
Light in color, vertex yellowish with three large black spots, two at apex and one median at base, elytra pale with infuscated areas along nervures**melissae**
- 3. Vertex brownish with pale margin, rounded, whole insect rather uniform in color with pale markings 4
Vertex black, obtusely angled, pronotum and scutellum black, elytra milky white with apex and areas on corium smoky**vanduzei**
- 4. Species large, 3.75 mm., anterior margin of vertex, costal margin of elytra and apical nervures pale**nigra**
Smaller, 3 mm. in length, margin of vertex, costal margin of elytra, a median oblong spot on pronotum crossing scutellum, and a broken commissural line along elytral suture, often shown by spots only, yellow**flavoscuta**

T. melissae Curtis (cited as *T. collina* Flor. by Van Duzee).

Eupteryx quinque maculata Baker.

Hemip. Homop. Br. Ids., 204, 1896.

Vertex produced, strongly rounded, two large black spots above apex and a large round black one at base. General color pale

green, pronotum with two central black spots at base, a small one and a curved line behind each eye. Elytra greenish hyaline, smoky at tips, nervures pale and a few cells spotted with fuscous. Length 3 mm.

A common form on catnip, sage and other Labiates. An European species, now known to occur in the United States both on Atlantic and Pacific coasts.

Granby, 10 Sept., 1909 (W. E. B.) (on sage).

T. vanduzeei (Gillette).

Proc. U. S. Nat. Mus., xx, 748, 1898.

Vertex produced, scarcely angled, black in color. Pronotum and scutellum black, elytra milky white, smoky at tips, often a dark area along middle of costa. Length 3.75 mm.

Occurs on ferns in New England in July and perhaps August.

Cromwell, 18 July, 1921 (B. H. W.), on ferns.

T. flavoscuta (Gillette). (Fig. 14, 5.)

Proc. U. S. Nat. Mus., xx, 749, 1898.

Vertex produced, bluntly rounded at apex. General color smoky above, yellow beneath. Face, anterior margin of vertex, median spot on posterior portion of pronotum, scutellum, costal and inner margins of elytra yellow. Length 3 mm.

On ferns in wooded areas during July and August.

Bridgeport, 20 Sept., 1920 (B. H. W.); East Haven, 21 July, 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.); New Haven, 11 July, 1920 (B. H. W.), on ferns; Cornwall, 5 June, 1921 (B. H. W.).

T. nigra (Osborn).

Rept. N. Y. St. Ent., xx, 543, 1905.

Vertex bluntly rounded, more robust than others of the group, black above anterior margin of vertex and costal margin, broadly yellow just before apex, which is smoky with nervures pale. Length 3.75 mm.

Taken only in shaded areas in woodland from ferns in cool moist habitats during July and August.

Bridgeport, 20 Sept., 1920 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.); Hamden, 20 June, 1920 (B. H. W.); New Haven, 11 July, 1920 (B. H. W.); Portland, 25 July, 1920 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.).

***T. inscripta** Sanders and DeLong.

Proc. Ent. Soc. Wash., 24, 99, 1922.

Milky white washed with yellow, elytra with a large central area on apical cross veins dark brown, from which brown lines radiate along veins to apex, costa and corium. Elytra with outer apical margin rounded, then concavely truncate toward inner margin. Female last ventral segment four times as long as preceding, posterior margin roundly excavated one-third the distance to the base, either side of a broad, central rounded tooth one-third

as broad as the segment and equaling in length the lateral angles. Male valve more than twice as long as last ventral segment, posterior margin with broad V-shaped notch extending from the lateral angles one-third the distance to the base. Plates narrower than valve and twice longer, margins almost parallel, tips broadly rounded.

This species was recently described from material collected in New Haven and also material collected in Kew Gardens, London, England, by Prof. J. G. Sanders.

New Haven, on pear; July 6, 1920 (B. H. W.), type material; 4 Aug., 1920 (B. H. W.); 19 June, 1921 (P. G.).

Empoa Fitch.

Anomia Fieber.

Typhlocyba Sahlberg.

Vertex very blunt in front, produced but scarcely angled. Elytral venation distinct as given in key with apical cell formed between outer and middle sectors, triangular. As a rule the species are rather pale in color with few dull markings.

This group of pale species are mostly shrub-feeding and a few are pests of shrubbery and fruit trees. All have two or more broods a season.

Key to Species.

- 1. White or yellow with bands or spots on the vertex, pronotum or elytra 2
 - White, yellow or greenish without dark markings 4
- 2. Elytra not banded, but with a transverse row of dark blotches before the cross veins 3
 - Whitish with transverse band across elytra *querci*
- 3. Pronotum with a dark spot on middle of anterior margin *ulmi*
Pronotum without black markings on anterior margin *tenerrima*
- 4. Yellow or white in color 5
 - Uniform greenish in color *fabae*
- 5. Sulphurous or orange-yellow, unmarked *lethierryi*
Very pale yellow or white, unmarked *rosae*

E. querci Fitch. Oak Leaf-hopper. (Fig. 8, 5.)

Homop. N. Y. St. Cab., 63, 1851.

Creamy white to yellowish with three blackish spots in a transverse row just before cross nervures of elytra. Length 4 mm.

Usually occurring on oak, but often taken from other trees and shrubs.

New Haven, 19 June, 1922 (B. H. W.).

E. querci var. *gillettei* Van Duzee. *Typhlocyba bifasciata* Gillette and Baker. (Fig. 14, 7.)

Cat. Hemip.; Hemip. Col., iii, 1895.

As in *querci*, yellowish, but with a broad smoky transverse band just in front of middle and another just before cross nervures. Length 4 mm.

It occurs in abundance on wild cherry during July and August.

New Haven, 26 June, 8 July, 1912 (at light); Hamden, 29 June, 1913 (B. H. W.) (on linden); Manchester, 16 Sept., 1920 (B. H. W.).

E. ulmi (Linnaeus). *Cicada ulmi* Linnaeus. Elm Leaf-hopper.
Syst. Nat., Edn. 10, i, 439, 1758.

Yellow, vertex with two black spots on anterior margin and a spot on anterior margin of pronotum. Elytra slightly infuscated on cross nervures, tergum black. Length 3.75 mm.

Originally taken from elm, but it seems to occur on other vegetation also.

E. tenerrima (Herrich-Schaeffer). *Typhlocyba tenerrima* Herrich-Schaeffer. *Typhlocyba rubi* Hardy. *Typhlocyba misella* Boheman.

Fauna Germ., cxxiv, No. 10a; clxiv, No. 16, 1834.

Yellowish with greenish tint, very slender, a transverse row of dusky blotches on the elytra just before cross nervures. Part of cross nervures black. Length 3 mm.

A shrub species, on hazel, and occasionally on alder during the summer.

New Haven, 21 June, 1922 (B. H. W.).

E. lethierryi (Edwards). *Typhlocyba lethierryi* Edwards.
Typhlocyba rosae Kirschbaum.

Ent. Mon. Mag., xvii, 224, 1881.

Form and size of *rosae*, but is a uniform sulphurous or orange-yellow without dark markings. Apex of elytra pale. Length 3.5 mm.

Reported from elm, but is found on maple and other trees in small numbers.

New Haven, 8 July, 1912 (at light).

E. rosae (Linnaeus). *Cicada rosae* Linnaeus. *Typhlocyba pteridis* Dahlbom. Rose Leaf-hopper.

Syst. Nat., Edn. 10, i, 439, 1758.

Pale yellow to milky white, without dark markings above. The tarsi, tip of proboscis and eyes usually brown. Upper portion of face often darker. Length 3.25-3.5 mm.

A very common and destructive pest on roses and frequently feeds on apple foliage so as to cause severe injury.

Yalesville, 19 Oct., 1903 (H. L. V.); New Haven, 3 Oct., 1902 (B. H. W.); 16, 31 Oct., 1903 (H. L. V.); 27 June, 1916 (B. H. W.); 4 Aug., 30 Oct., 1920 (B. H. W.); Orange, 15 Sept., 1920 (B. H. W.); Guilford, 17 July, 1920 (B. H. W.); New Haven, 4 July, 1921 (B. H. W.).

E. fabae (Harris). *Tettigonia fabae* Harris. Bean-Vine Leaf-hopper.

Rept. Ins. Mass., 186, 1841.

Head crescent-shaped, the male with two long thin recurved plates. Color uniformly pale green, the wings and wing covers transparent and colorless. Hind tarsi bluish. Length 3.5 mm.

Originally described as a pest of beans, but no doubt occurs on other forms of vegetation as do others of this group. A rather uncommon form, and perhaps is an *Empoasca*.

East River, 8 Aug., 1908 (C. R. E.); New Haven, 7 July, 1909 (B. H. W.).

Erythroneura Fitch.
Zygina Fieber.
Idia Fieber.

Vertex produced distinctly but rather bluntly angled, with apex usually slightly rounded. Elytra with apical cell between outer and middle sectors quadrate, elongate, the sectors joined by a cross nervure. Usually brightly colored.

Among the species belonging here are several very destructive to vineyards and known as "grape leaf-hoppers." Some of these are found only occasionally or in limited areas, others are pests and are widespread and distributed over the entire United States. As a group they hibernate as adults under leaves in wooded areas, or under the rough loose bark of shade and fruit trees, and can be found almost anytime during the winter by pulling off the loose bark or sifting among the leaves. Most of these are pale with bright color markings.

Key to Species.

1. Without three distinct transverse bands 2
 With three distinct transverse dark bands, one crossing pronotum
 and two crossing elytra**tricincta**
2. Almost entire coloring concentrated on elytra before cross nervures 3
 Coloring not concentrated on basal portion of elytra, often pale
 with slight markings 7
3. Coloration bright red 4
 Coloration in form of a basal brown transverse band on elytra ..
 **comes** var. **basilaris**
4. Base of elytra almost solidly and uniformly red 5
 Base of elytra entirely flecked with red**trifasciata**
5. Head and pronotum without red markings 6
 Head and pronotum marked with red, basal two-thirds of elytra red
 **crevecoeuri**
6. Costal areas and a large round spot at middle of elytra on com-
 missural line, white**hartii**
 Elytra without commissural white spot**tunicarubra**
7. Elytra without black spot on corium 8
 Elytra with a large black spot often red margined, at middle of
 claval suture; vertex, pronotum and scutellum often each with a
 red spot**illinoiensis**
8. Elytra pale with red markings 9
 Color dark almost uniform, often with pale spots 10
9. An oblique red line on clavus and one on inner sector of elytra *obliqua*
 Marking in form of zigzag or broken lines or spots
 **comes** and var. **maculata**
10. A pale median line on vertex, pronotum and scutellum with a dash
 either side of it on vertex and pronotum 11

Only a few of the varieties occur in vineyards and these in very small proportions. Such forms as *ziczac* are more abundant on woodbine and other vines and are seldom found on grapes. So from field observations it is doubtful whether some of these should have varietal or specific ranking.

New Haven, 16 Oct., 1903 (H. L. V.); 20 May, 1920 (B. H. W.); North Branford, 16 June, 1922 (B. H. W.); East Haven, 10 May, 1921 (B. H. W.).

E. comes var. *ziczac* Walsh.

Proc. Bost. Soc. Nat. Hist., ix, 317, 1864.

With spots and lines coalescing to form a zigzag coloration from anterior costal margin to apical portion, often smoky. A large dark spot at middle of costa.

Hamden, 23 Oct., 1921 (B. H. W.); New Haven, 12 May, 1921 (B. H. W.).

E. comes var. *vitis* (Harris).*

Encyc. Am., viii, 43, 1831.

Usually a red band across scutellum, pronotum and basal angles of elytra, a broad red one across middle, ending in bluish spots on costa, and tips of elytra blackish. Central reddish band surrounded by white.

New Haven, 13 Sept., 1920 (B. H. W.). Boston Ivy.

E. comes var. *basilaris* (Say).

Jour. Acad. Nat. Sci. Phila., iv, 344, 1825.

As in *comes* but with base of elytra dark brown, often extending over scutellum and most of pronotum.

North Haven, 24 Sept., 1921 (B. H. W.).

E. comes var. *infusata* (Gillette).

Proc. U. S. Nat. Mus., xx, 764, 1898.

A broad black stripe extending over vertex, pronotum, scutellum and along elytra to apex. A dark spot at tip of clavus is surrounded by a white ring.

E. comes var. *rubra* (Gillette).

Proc. U. S. Nat. Mus., xx, 764, 1898.

Spots coalescing so as to give almost entire reddish coloring above.

E. comes var. *maculata* (Gillette).

Proc. U. S. Nat. Mus., xx, 764, 1898.

Lines broken up into a great number of round reddish spots.

New Haven, 16 Oct., Yalesville, 19 Oct., 1903 (H. L. V.); North Haven, 24 Sept., 1921 (B. H. W.).

E. comes var. *scutellaris* Gillette.

Proc. U. S. Nat. Mus., xx, 764, 1898.

Scutellum black, elytron often milky white without red markings.

* McAtee evidently regards *vitis* as a species and described the var. *stricta*. See Trans. Am. Ent. Soc., xlv, 305, 1920. (W. E. B.)

E. illinoiensis (Gillette). *Typhlocyba illinoiensis* Gillette.

Proc. U. S. Nat. Mus., xx, 758, 1898.

White or yellowish, elytra always with three black spots, one at base of inner apical cell, one midway along costa and the third and largest margined with red and situated just outside of clavus not quite half way to its apex. Vertex, pronotum and scutellum each often with a large red spot. Length 3 mm.

Feeds on grape and other vines, often found in woodland.

E. obliqua (Say). *Tettigonia obliqua* Say. (Fig. 14, 6.)

Jour. Acad. Nat. Sci. Phila., iv, 342, 1825.

Whitish, vertex, pronotum and scutellum with two red longitudinal lines. Elytra with three oblique red stripes extending toward inner margin. Length 3 mm.

With its varieties this species occurs on grapes and is taken in practically all sweepings from shrubs and trees in woodland. It hibernates as an adult under leaves or bark in sheltered places and can be found on warm days in winter and early spring coming out of these shelters.

Yalesville, 19 Oct., 1903; New Haven, 7 May, 1904 (H. L. V.); 22 Sept., 1918 (F. H. L.); Orange, 15 Sept., 1920 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.); Hamden, 25 Apr., 1921 (B. H. W.); North Haven, 24 Sept., 1921 (B. H. W.).

E. oblique var. **dorsalis** (Gillette).

Proc. U. S. Nat. Mus., xx, 757, 1898.

Coloration coalescing to form a broad red or dark median dorsal stripe extending from apex of vertex to tip of elytra.

New Haven, 22 Sept., 1920 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.).

E. obliqua var. **noevus** (Gillette).

Proc. U. S. Nat. Mus., xx, 757, 1898.

Differs from typical *obliqua* only by a black area covering all of scutellum and median posterior part of pronotum.

E. obliqua var. **fumida** (Gillette).

Proc. U. S. Nat. Mus., xx, 758, 1898.

Dark or entirely dusky colored throughout.

E. vulnerata Fitch.

Homop. N. Y. St. Cab., 62, 1851.

Brownish green to black, marked with white. A common white line on vertex and pronotum. Elytra with costa white crossed near middle by a black line. A few pale areas usually conspicuous. Length 3 mm.

Collected from many vines and shrubs and apparently feeds on more than one plant. Among those recorded are grape, Virginia creeper and elm. It hibernates as an adult.

New Haven, 14 May, 1904 (H. L. V.); 13 Sept., 1920 (B. H. W.).

E. vulnerata var. **nigra** (Gillette).

Proc. U. S. Nat. Mus., xx, 765, 1898.

Black with a white area on middle of costa and a yellow spot on inner basal angle of elytra behind scutellum.

E. crevecoeuri (Gillette).

Proc. U. S. Nat. Mus., xx, 767, 1898.

Yellowish pronotum and scutellum with two red longitudinal lines, face yellow suffused with red. Scutellum entirely red or black, elytra with basal two-thirds reddish, yellow beyond tip of clavus and with costal area at base more or less yellowish. Length 3 mm.

Occurs in wooded areas on foliage, not a common species.

Family MEMBRACIDAE.

By WILLIAM DELBERT FUNKHOUSER, A.M., PH.D.

CHARACTERS OF THE FAMILY.

The family Membracidae is characterized by the extreme development of the pronotum which usually extends backward to cover the mesonotum and metanotum and often completely conceals the entire abdomen, the presence of two ocelli only, the poorly developed hair-like antennae situated below and slightly in front of the eyes, the trimerous tarsi, and the usually membranous and characteristically veined wings.

TAXONOMIC POSITION.

Although the taxonomic position of the families of the Homoptera, and indeed the validity of the systematic divisions themselves, have long been a subject of discussion among hemipterists, there seems to be abundant evidence to indicate that the Membracidae are entitled to only a very low place in the phylogenetic arrangement of the families. The pronotum, to be sure, is highly specialized, but the sensory system is very poorly developed, the wings are extremely generalized, and the genital organs have developed very little from the ancient type.

Phylogenetic studies would suggest that the Membracidae should be placed between the Cicadidae (which may be considered the lowest or most generalized of the homopterous families) and the Cicadellidae, with strong affinities toward, and probably from the same stem as, the latter.

DISTRIBUTION.

The family Membracidae is primarily a tropical and subtropical group of insects and is represented in greatest numbers in South America, northern Africa and southern Asia. It is in these

regions that the many curious and grotesque forms, which are so often figured to illustrate extreme pronotal development, are most abundant, and that the number of genera and species reach the maximum. In North America the family is best represented in Mexico where the characteristic bizarre forms are plentiful. Southern United States shows fewer species and these lose their grotesque appearance as they spread northward. Northern United States continues to show the thinning-out of the forms as the climate becomes colder, and the native species are on the whole smaller and of less striking development. Of over three hundred genera established in the family, only forty are found in North America and of these a number are represented by a single species only.

As is to be expected, therefore, the New England States are near the northern limits of membracid fauna (only a few species are found in Canada) and the small number of species represented makes the determination of forms a comparatively easy task. Approximately one hundred species, representing about twenty genera, are recorded from this region.

HABITAT AND HABITS.

The Membracidae are primarily tree and shrub inhabiting insects; a few species may be taken in general sweeping but the great majority are to be found on the lower branches of trees (seldom more than twenty feet from the ground) and particularly on small saplings, bushes and shrubs. They are sun-loving creatures and are found oftenest on plants growing in open fields, along roadsides, and at the edges of timber. They are seldom seen in shady woods.

The adults of many species have the habit of arranging themselves in rows on the branches or trunk, generally with the head pointing toward the base of the branch, or pointing downward if on the trunk. Nymphs are usually found tightly flattened in crevices of the bark or pressed closely in the axil of a leaf or the crotch of a twig. Both adults and nymphs show a considerable amount of protective resemblance, particularly those species which are provided with dorsal horns or crests.

Some species are decidedly gregarious and congregate not only as individuals of the same species but also with other species (e.g., *Thelia bimaculata* and *Vanduzeei* on the locust), others live together as individuals of a species but are seldom found with other species (e.g., *Enchenopa binotata* on the butternut), others spend their nymphal lives as a family group but separate on reaching maturity (*Ceresa bubalus* on sweet clover), while others are usually solitary both as nymphs and adults (most species of the genera *Telamona*, *Smilia* and *Carynota*). There is reason to

believe that gregarious habit is largely dependent on the host plant, the abundance of the species and the number of eggs in an egg-mass.

Membracids are usually most active during the warmest parts of the day and on the warmest days of the year. The stimulus of heat (or perhaps sunlight) seems to be important for the activities of feeding, mating and oviposition. When at rest the insect generally chooses the underside of the first or second-year growth of trees or the upright stem of herbaceous plants; if approached it often moves around to the opposite side of the twig or stem and makes no attempt to fly except as a last resort in escaping.

Locomotion consists of three methods, walking, flying and jumping, as mentioned in order of importance. On the whole, most species are sluggish and move but little unless disturbed. Migration is extremely slow, either from plant to plant or from one locality to another. Individuals almost invariably return to the same host from which they have been disturbed and it is a common experience to find one tree or shrub crowded with individuals while another host of the identical species is unmolested a few rods away. The insects fly well for short distances only (the record flight as measured by the writer was fifty yards for a female of *Telamona unicolor*) with a sharp, whirring, erratic flight which is hard to follow with the eye. It seems reasonable to believe that the size, weight and shape of the over-developed pronotum of most species is responsible for their poor performances in the air. In the matter of jumping, also, the membracids fail to live up to their common name of "tree-hoppers," since their exhibitions of leaping are not at all spectacular or impressive. The insect leaves the support with a quick snap which is doubtless of value in escaping enemies but which carries it only a short distance and is in fact only a "take-off" for flight. There is no true leaping or hopping from twig to twig or from leaf to leaf.

In feeding, the insects show no peculiarities, little energy is displayed in the feeding movements, and the process is a leisurely one. The beak is well fitted for piercing the tender leaves and petioles and is often buried so deeply in the tissue of the plant that it is broken off when the specimen is suddenly captured.

A large number of species are attended by ants, the latter insects collecting the so-called "honey-dew" excreted from the anus of both nymphal and adult forms of Membracidae. It has been shown that this fluid is simply an intestinal waste, not secreted by special glands, but perhaps containing sugars in solution. The ants are very attentive to their charges while collecting this fluid, constantly stroking the membracids with their antennae and attacking without hesitation any intruder—even the fingers of the collector—which threatens to disturb the process. It is interesting to note that certain species (e.g., *Enchenopa binotata*) are apparently never attended by ants although both nymphs and adults of

the species secrete the anal fluid, while closely related species (e.g., *Enchenopa ferruginea*) are favorites with the formicide herdsmen. Ants which are commonly found attending membracids in north-eastern United States are *Formica obscuriventris* Mayr., *Formica exsectoides* Forel, *Camponotus pennsylvanicus* DeGeer, *Crematogaster lineolata* Say and *Prenolepis imparis* Say.

LIFE HISTORIES.

Most, if not all, of the New England species winter over in the egg stage and the first appearance of the insects in the Spring is the emergence of the nymphs from the winter eggs, which occurs from late April to early June according to the locality, the weather, and the species concerned. Mating begins almost immediately after the insect reaches maturity, and oviposition occurs within a week after mating. The eggs are laid usually in the bark of young stems, in the buds, in the midribs of leaves, or in the soft stems of herbaceous plants. The place and method of oviposition is apparently very definite for each species and varies within a genus. In most cases the egg-slits are very superficial and the eggs are but poorly protected by the overlying epidermis, bark, or bud scales; in some cases the tips of the eggs are plainly visible. The mechanics of the process differ decidedly in the various species and the appearance of the egg-slit is often a good clue to the species concerned. The number of eggs in the egg-mass and the arrangement of the eggs with respect to each other and to the slit also show considerable variation but the most common appearance is a palmate arrangement of from three to six white, club-shaped eggs in a shallow, curved slit, the tips (anterior ends) close together and the bases somewhat separated one from another. The time of hatching depends to a large extent upon climatic conditions and often the eggs of a single egg-mass show a considerable variation in this respect. The process of hatching has been observed for many species and shows no unusual features. The eggs become swollen a few days before hatching, the chorion about the neck and upper end cracks and, sometimes several days after the cracking of the egg, the cap is forced upward and the head of the nymph appears, quickly followed by the thorax and abdomen and more slowly by the legs. The time required for the process, from the time the head is first seen until emergence is completed, is usually about half an hour.

Five instars are shown in the development of the nymph. Each of these instars is distinct enough to be recognized, and displays characters sufficient not only for the recognition of the species but also for the identification of the particular stage of development that it represents. The most important of these characters are the number, arrangement and shape of the dorsal spines, the structure of the prothorax and the configuration of the head.

About six weeks are required in development of which in most cases the first four instars consume approximately a week each and the last instar two weeks.

A few species (e.g., *Vanduzee* *arquata* and *Entylia* *bactriana*) have two or more broods a year depending on seasonal conditions. In such cases there is much variation in the time required for the various periods of development and it often happens that nymphs of all stages and adults of different ages may be collected practically throughout the entire Summer. In such cases, also, the individuals of the last brood often fail to reach maturity before they are killed by cold weather.

Very few of the species of Connecticut winter over in the adult stage but it is possible that *Entylia* *bactriana*, *Campylenchia* *latipes* and *Publilia* *concava* may show such hibernation, as adults are often taken suspiciously early in the Spring.

HOSTS.

The various species of Membracidae usually confine themselves to very definite host plants and are excellent botanists. In many cases the association between the insect and its host is so characteristic that a knowledge of the one is sufficient for the recognition of the other. Several of the species change their host plants during their life cycle, the nymphs feeding on one plant, usually some succulent weed; the adults ovipositing on another, usually a tree. A wide variety of hosts have been recorded for the family, about fifty plants common to Connecticut being known as favorites, most of which are either nutbearing trees, legumes, Rosaceae or composites. The specific hosts are here recorded, when known, under the discussion of the various species.

ECONOMIC IMPORTANCE.

As a family the Membracidae are not to be considered as of any great economic importance and very few of the species found in Connecticut have ever been accused of causing any considerable damage to host plants. Careful field notes, extending over a number of years, would indicate that the amount of sap consumed by the insects in feeding is negligible since no detrimental effect has been observed from this cause. The damage done in oviposition is very slight since the egg-slits are superficial, in woody plants seldom extending to the cambium, and usually healing over without leaving a scar.

A few exceptions, however, may be noted. *Ceresa* *bubalus* makes a peculiar curving egg-slit and several slits are often made so close together that a definite area is cut out of the bark which leaves a characteristic line of scars on young twigs. *Ceresa* *borealis* likewise makes rather deep wounds which sometimes fail to heal and may become infected with fungi. Three species,

Ceresa taurina, *Stictocephala inermis* and *Enchenopa binotata* often lay their eggs in buds; if the buds are not large the eggs may be so deeply inserted as to cause malformations and (in the case of fruit buds) economic loss.

On the whole, however, it is believed that such injuries are of such rare occurrence that they may be discounted when compared with the ravages of the really important insect pests.

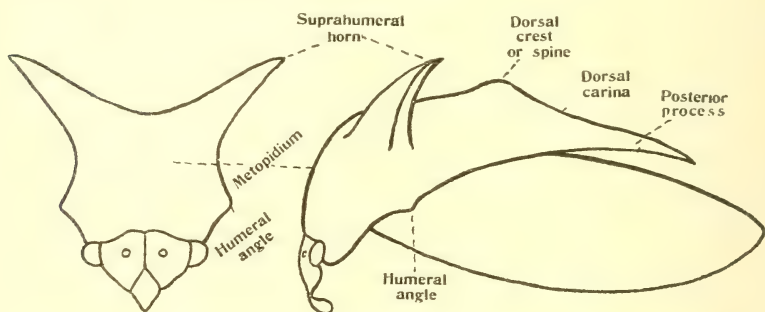


FIG. 15. A Membracid, front and lateral views, showing structures used in classification. Much enlarged. Drawing by Dr. W. D. Funkhouser.

EXTERNAL STRUCTURES AND NOMENCLATURE.

On account of the fact that the specific and generic characters of the Membracidae are largely based on peculiar pronotal developments and other external structures, it is perhaps desirable to call attention to a few of these special anatomical features in order that the taxonomic keys may be easily used. The fact that the insects of this family show such unusual pronotal structures (often extravagantly produced, spined, barbed or branched) has naturally been seized upon by systematists in the description of species and there is no question but that these structures, although apparently of little physiological significance, are quite constant and of considerable taxonomic value. Since the structures are in many cases peculiar to the family, there has naturally developed a terminology which is not entirely applicable to other homopterous groups and not at once recognizable to the general systematist.

On the head, the most important points to be noticed are the absence of the *frons* (which probably explains the absence of the third ocellus), the relative position of the remaining two ocelli particularly with regard to the eyes, the shape of the *clypeus* and the outline of the head as a whole (Fig. 16).

The pronotum is usually the only part of the thorax visible. It is inclined to show development in one or more of four ways—posteriorly (to form extensions over the abdomen), anteriorly (producing porrect or other processes), dorsally (in the form of

crests or humps), and laterally (developing the familiar "horns" over the humeral angles). All of these, with several combinations, are found in Connecticut species. Arbitrary names which are commonly used to designate these structures are the following:

Metopidium (Fig. 15)—that area of the cephalic part of the pronotum reaching from the dorsum to the base of the head.

Humeral angles (Fig. 15)—the swellings, very characteristic of the family, found on the lateral margins of the prothorax just above the bases of the forewings.

Superhumeral or *suprahumeral horns* (Fig. 15)—lateral projections on the edge of the metopidium just above the humeral angles.

Posterior process (Fig. 15)—the posterior extension of the pronotum. Perhaps the most important and most commonly used character of all of the prothoracic structures.

Dorsal carina (Fig. 15)—the median dorsal ridge, often percurrent.

Dorsal crest or *dorsal spine* (Fig. 15)—elevations of any part of the dorsum.

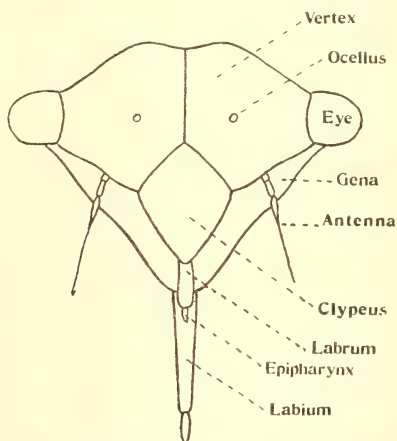


FIG. 16. Membracid, front view of head, showing structural parts. Much enlarged. Drawing by Dr. W. D. Funkhouser.

The venation of the wings furnishes valuable characters for both generic and specific diagnosis. Of these characters the most important are to be found in the hind wings which unfortunately are often hidden under the forewings (the *tegmina*) making it necessary to relax the specimen for purposes of study. The points to be particularly noticed in the wings are the number of discoidal and apical cells, the shape of the terminal or median apical cell, the cross veins in the basal region, and the appearance of the basal costal margin, all of which are shown in figure 17. In the discussion of the membracid wing, reference is often made to the *corium* and the *clavus*. The terminology here is the same as is usually applied to hemipterous wings in general in which the basal portion consists of two pieces, the term "clavus" being used to

designate the narrow posterior piece which is next to the scutellum when the wing is closed (Fig. 17) and the term "corium" applied to the remainder of the basal area. The position of the internal angle (Fig. 17) of the tegmen with relation to the end of the posterior process is a character often mentioned. The wings of most membracids show a decided terminal membrane (Fig. 17); in a few cases the width of this membrane has been used as a taxonomic character.

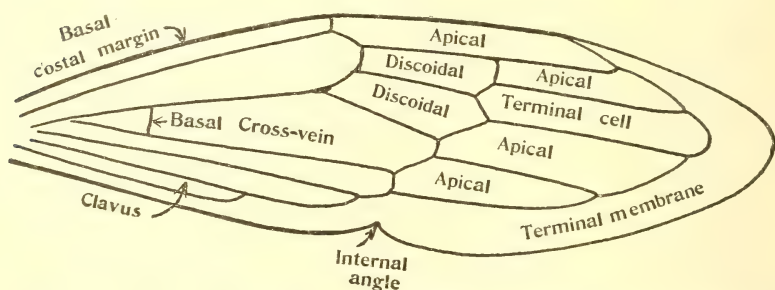


FIG. 17. Wing of a Membracid showing venation. Much enlarged. Drawing by Dr. W. D. Funkhouser.

Although in the systematic consideration of the family as a whole the structure of the legs are of great importance, these characters are of little significance in the discussion of species of northern America due to the fact that the subfamilies in which leg characters are of value are not represented in the northern fauna. The only point in the diagnosis of Connecticut forms at which it is necessary to note leg structure is in the separation of the subfamilies *Membracinae* and *Smiliinae* in which the foliaceous tibiae of the species of the former afford the simplest taxonomic character for setting off the subfamily.

CONNECTICUT SPECIES.

Published records show a surprisingly small number of species of Membracidae as having been actually reported from Connecticut. In Van Duzee's recent catalogue* only three species (*Ceresa brevicornis*, *Stictocephala lutea* and *Cyrtolobus querci*) are credited to the State and there are very few references in literature to Connecticut representatives of this family. This is due, however, to a lack of records rather than to a paucity of species, since of the seventy-five species which are here considered as forms which may be reasonably expected to occur in the State, only five are as yet unreported.

* Van Duzee, E. P. Catalogue of Hemiptera North of Mexico, University of California Press, 1917.

The following pages include the species which are believed to be represented in the Connecticut fauna. In the preparation of this paper it is presumed that if a species is common throughout the New England States it will be found in Connecticut; certainly if it is known to be abundant in eastern New York and in Massachusetts it may be reasonably supposed to occur in Connecticut and is here included. This list does not include, however, a number of species which have been reported from Long Island, since although geographically close to Connecticut, the Long Island region seems to represent a rather distinct faunal area, extending westward and southward but not northward.

The writer is greatly indebted to Dr. W. E. Britton, State Entomologist, for records and material from the State, and to Mr. Lewis B. Woodruff of New York City whose careful collecting in the neighborhood of Litchfield has added many records to the State list and whose kind assistance in the matter of locality and host records has been most valuable in bringing this paper up to date.

CLASSIFICATION.

The Membracidae are usually divided into five subfamilies of which only three are represented in northeastern United States. These three may be separated as follows:

Key to Subfamilies.

1. Scutellum wanting or concealed by the pronotum 2
Scutellum distinctCENTROTINAE
2. Anterior tibiae foliaceousMEMBRACINAE
Anterior tibiae simpleSMILIINAE

Very few species of the subfamily Centrotinae are found outside of the tropics and of these but one species occurs in the New England States. The Membracinae are slightly better represented in temperate regions but only two species are found in Connecticut. All the rest of the forms here discussed are representatives of the great subfamily Smiliinae which is the dominant membracid group in this country.

Key to Genera.

1. Scutellum distinct
 - a. Posterior end of scutellum visible**Microcentrus**, p. 172
 - b. Scutellum visible only at sides**Gargara**, p. 172
- Scutellum wanting or concealed 2
2. Anterior tibiae foliaceous 3
Anterior tibiae simple 4
3. Anterior ridges of pronotal horn close to superior margin of horn;
inferior carina of horn not foliaceous**Campylenchia**, p. 173
Anterior ridges of pronotal horn in center of horn; superior and
inferior carinae of horn foliaceous**Enchenopa**, p. 174
4. Tegmina entirely free, not covered by pronotum 5
Tegmina partly or entirely covered by pronotum 8
5. Veins of corium closely united at base 6
Veins of corium widely separated at base 7

6.	Suprahumeral horns present	Ceresa , p. 175
	Suprahumeral horns absent	Stictocephala , p. 179
7.	Tegmina with five apical areas; veins distinct	Acutalis , p. 180
	Tegmina with four apical areas; veins indistinct ..	Micrutalis , p. 181
8.	Terminal cell of hind wing sessile, its base truncate	9
	Terminal cell of hind wing triangular and petiolate	14
9.	Pronotum without horn or crest	10
	Pronotum with horn or crest	11
10.	Dorsum low and rounded	Carynota , p. 182
	Dorsum high, compressed and foliaceous	Archasia , p. 192
11.	Horn a flat dorsal crest	12
	Horn anterior and porrect	Thelia , p. 183
12.	Crest arising from behind humeral angles	13
	Crest arising from between humeral angles	Glossonotus , p. 184
13.	Crest step-shaped	Heliria , p. 185
	Crest not step-shaped	Telamona , p. 186
14.	Base of corium with three veins	15
	Base of corium with two veins	19
15.	Corium with cross vein at base	16
	Corium without cross vein at base	Smilia , p. 192
16.	Dorsum strongly compressed	17
	Dorsum rounded	Ophiderma , p. 202
17.	Pronotum not inflated posteriorly	18
	Pronotum inflated posteriorly	Xantholobus , p. 201
18.	Crest highest anteriorly	Atymna , p. 198
	Crest highest near middle	Cyrtolobus , p. 193
19.	Terminal cell of tegmen triangular	20
	Terminal cell of tegmen transverse	Vanduzee , p. 204
20.	Dorsum strongly elevated, with deep median notch	Entylia , p. 205
	Dorsum only slightly elevated, with weak median depression	Publilia , p. 206

Microcentrus Stål.

This genus of the subfamily Centrotinae has but one species in New England. This insect may be at once distinguished from all other local Membracidae by its entirely uncovered scutellum. In general appearance it suggests a large cercopid.

M. caryae (Fitch).

1851. *Uroxyphus caryae* Fitch. Cat. Ins. N. Y., 52.
 1851. *Centrotus caryae* Walker. List. Hom. Brit. Mus., 1147.
 1869. *Microcentrus caryae* Stål. Bid. Memb. Kan., 295.
 1896. *Phaulocentrus caryae* Fowler. Biol. Centr. Amer., 159.

Fairly common throughout northeastern United States on hickory. Has not been reported from Connecticut but is known to extend from Ohio and Pennsylvania northeastward into Canada. Common in New York and Massachusetts. Life history unknown.

Hosts: Hickory, oak.

Gargara Amyot and Serville.

Only one species is known to occur in the United States.

G. genistae (Fabricius).

1764. *Cicada genistae* Geoffroy. Ins., i. 424. 19.
 1781. *Cicada genistae* Fabricius. Sp. Ins., ii. 318. 17.

1792. *Membracis genistae* Petagna. Inst. Ent., ii. 617. Pl. 9, fig. 2.
 1802. *Centrotus genistae* Tigny. Ins., 118.
 1833. *Smilia genistae* Germar. Silb. Revue, iii. 240. 21.
 1839. *Oxyrhachis genistae* Burmeister. Ent., ii. 133. 2.
 1843. *Gargara genistae* Amyot and Serville. Hem., 538.

This is an European species which has apparently only recently been introduced into the United States. Its appearance was first called to my attention in the summer of 1919 by Mr. E. H. Gibson who sent specimens for determination. These specimens had been collected by Mr. Edgar L. Dickerson and Mr. H. B. Weiss in New Jersey. Under date of September 15, 1919, Mr. Dickerson wrote that the insect had been observed for a couple of years previous on *Caragana arborescens* in two nurseries in New Jersey. It seems probable, therefore, that the species was originally introduced into this country on nursery stock.

The insect was not reported again until March, 1921, at which time Dr. W. E. Britton sent me specimens which had been collected in New Haven, Conn., the preceding summer.

Gargara genistae may be distinguished at once from *Microcentrus caryae*, the only other species of the subfamily Centrotinae found in the New England States, by the fact that in *G. genistae* the posterior process of the pronotum is long, extending halfway to the end of the abdomen and exposing the scutellum only at the sides, while in *M. caryae* the posterior process is very short, barely reaching the abdomen, and the scutellum is plainly visible from a dorsal view.

New Haven, 29 July, 1920 (M. P. Z.).

Campylenchia Stål.

One of the two genera of the subfamily Membracinae represented in the State. Distinguished by the fact that the lateral ridges of the pronotal horn are located close to the superior margin of the horn and the inferior half of the horn is not foliaceous.

C. latipes (Say).

1824. *Membracis latipes* Say. Narr. Long's Exp., App. ii, 302.
 1851. *Enchenopa latipes* Walker. List Hom. Brit. Mus., 482.
 1851. *Enchophyllum latipes* Fitch. Cat. Ins. N. Y., 47.
 1851. *Enchenopa antonina* Walker. List Hom. Brit. Mus., 488.
 1851. *Enchenopa venosa* Walker. List Hom. Brit. Mus., 488.
 1851. *Enchenopa frigida* Walker. List Hom. Brit. Mus., 490.
 1851. *Enchenopa bimacula* Walker. List Hom. Brit. Mus., 491.
 1869. *Campylenchia curvata* Stål (part). Hem. Fabr., ii, 43.
 1876. *Enchenopa curvata* Uhler. List Hem. West Miss. Riv., 343.
 1877. *Aconophora curvata* Butler. Cist. Ent., ii, 349, No. 16.
 1902. *Enchenopa rectidorsum* Buckton. Mon. Memb., 49.
 1914. *Campylenchia latipes* Van Duzee. Can. Ent., 46, 389.

This species shows a considerable amount of variation in color and particularly in the shape and position of the pronotal horn, and has for this reason been redescribed under a number of names

as indicated in the above synonymy. It may be at once distinguished, however, from *Enchenopa binotata* Say, the only other representative of the subfamily Membracinae in Connecticut, by the lack of yellow markings on the dorsum.

Abundant throughout the northeastern part of the United States. A grass-inhabiting species usually taken in sweeping. Common in pastures. Seems to prefer leguminous plants and is partial to alfalfa and sweet clover.

The eggs are laid at the base of the stems and tops of the roots of the host plant and the species usually winters over in the egg stage although there is some evidence to the effect that the adults may occasionally survive by hibernation.

Hosts: Alfalfa, sweet clover, wild carrot, joe-pye weed, daisy, New England aster.

New Haven, 6 July, 1904 (H. L. V.); 30 July, 1904 (B. H. W.); 30 July, 1914 (Q. S. L.); East Wallingford, 6 July, 1904 (W. E. B.); Scotland, 27 July, 1904 (B. H. W.); Branford, 27 June, 1904 (H. L. V.); Portland, 8 Aug., 1913 (B. H. W.); Litchfield, Aug. and Sept. (L. B. W.); Kent, 10 Aug., 1918 (M. P. Z.); Goshen, 4 July, 1919 (M. P. Z.); Cornwall, 16 Aug., 1920 (K. F. C.); Westport, 24 June, 1921 (W. E. B.).

Enchenopa Amyot and Serville.

Distinguished from the preceding genus by the fact that the lateral ridges of the pronotal horn are located about equally distant from the superior and inferior margins, and both the superior and inferior margins are strongly flattened and foliaceous.

E. binotata (Say). (Pl. iv, 25.)

1824. *Membracis binotata* Say. Narr. Long's Exp., App. ii, 301.

1851. *Enchophyllum binotatum* Fitch. Cat. Ins. N. Y., 47.

1851. *Enchenopa binotata* Walker. List Hom. Brit. Mus., 481.

1851. *Enchenopa brevis* Walker. List Hom. Brit. Mus., 492.

1854. *Thelia binotata* Emmons. N. Y. Agr. Rept., v, 156.

1858. *Enchenopa bifusifera* Walker. List Hom. Brit. Mus., Suppl. 125.

1903. *Enchenopa porrecta* Buckton. Mon. Memb., 51. pl. 6, fig. 5-5b.

1913. *Enchenopa permutata* Branch. Kans. Univ. Sci. Bull., 8. 111.

A very abundant species on trees, shrubs and vines. Particularly common on butternut, locust and bittersweet. Seldom found in the grass, in which respect it differs from the preceding species. At once identified by the two bright yellow spots on the dorsal line of the pronotum.

The life history of this species has been described in detail by Matusch (Matusch, Ignaz. Journ. N. Y. Ent. Soc., xx, 58-67. 1912) and by Funkhouser (Journ. Econ. Ent., viii: 368-371. 1915).

Hosts: Locust, wild grape, bittersweet, hickory, sycamore, dogwood.

New Haven, 19 July, 1913 (L. B. R.); 6, 9 July, 1914 (M. P. Z.); Branford, 29 July, 1904 (P. L. B.); Wallingford, 3, 8 Aug., 1912 (D. J. C.); Litchfield, Aug. and Sept. (L. B. W.).

Ceresa Amyot and Serville.

A genus usually recognized by the large size, the more or less triangular shape, and the prominent suprahumeral horns of the insects. The color, with two exceptions, is green or greenish. It is one of the most common and widely distributed of the genera represented in the State.

Key to Species.

1. Brown with transverse bands 2
Green or greenish without bands 3
2. Large, dark-colored, tegmina strongly marked with brown; posterior process with two white bands **diceros**
Small, light-colored, tegmina hyaline or only faintly clouded; posterior process with one white band **albescens**
3. Undersurface of body not strongly marked with black 4
Undersurface of body strongly marked with black **basalis**
4. Dorsal crest marked with brown or reddish; species small 5
Dorsal crest concolorous 6
5. Horns long, sharp, much recurved and elevated **constans**
Horns short, little elevated, only slightly recurved **palmeri**
6. Pronotum only sparingly pubescent or entirely smooth 7
Pronotum densely hairy **borealis**
7. Large, 8-10 mm. 8
Small, 7-8 mm. 9
8. Horns long, sloping upward, recurved; clypeus much prolonged beyond vertex **taurina**
Horns stout, nearly straight; clypeus short **bubalus**
9. Horns long, acute, slightly curved backward **brevis**
Horns short, bluntly triangular **brevicornis**

C. diceros (Say). (Pl. iv, 9.)

1824. *Membracis diceros* Say. Narr. Long's Exp., App. ii, 299.

1835. *Smilia diceros* Germar. Silb. Rev., iii, 237.

1843. *Ceresa postfasciata* Amyot and Serville. Hem., 540, pl. 10, fig. 3.

1846. *Ceresa diceros* Fairmaire. Rev. Memb., 285, no. 11.

1903. *Ceresa vitidialis* Buckton. Mon. Memb., 172, pl. 36, figs. 3-3b.

Widely distributed. Has been recorded on a large number of hosts but most commonly on black elder (*Sambucus canadensis*). Seems to prefer low plants.

Recognized by its dark brown color with transverse whitish bands, the stout humeral horns, decurved posterior process, and infusate tegmina.

Field studies have indicated that its entire life history is spent on one host.

Hosts: Elder, locust, white oak, sycamore, sweet clover, blackberry, butternut, boneset, goldenrod, clematis, grape, wild cherry (*Prunus pennsylvanicus*).

New Haven, 19 July, 1905 (B. H. W.); 7 Aug., 1910 (W. E. B.); Goshen, 6 July, 1919 (M. P. Z.); Branford, 29 July, 1904 (P. L. B.); Prospect, 15 Aug., 1906 (W. E. B.); Litchfield, Aug. and Sept. (L. B. W.); Portland, 24 July, 1921 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.).

C. albescens VanDuzee.

1908. *Ceresa albescens* Van Duzee. Bull. Buff. Soc. Nat. Sci., ix, 35.

Rare. In eastern New York it is most likely to be found on

blackberry. Distinguished from *C. diceros*, the only species with which it is likely to be confused, by its smaller size, lighter color, hyaline tegmina, and difference in arrangement of bands on the pronotum. Its life history is not known.

Hosts: Blackberry, raspberry.

Stamford, 16 Aug., 1912 (W. E. B.); North Branford, 24 July, 1921 (M. P. Z.).

C. basalis Walker.

1851. *Ceresa basalis* Walker. List Hom. Brit. Mus., ii, 527.

1893. *Ceresa melanogaster* Osborn. Bul. Nat. Hist. Lab. Iowa State Museum, ii, 390.

1894. *Ceresa turbida* Goding. Cat. Memb. N. A., 404.

1903. *Ceresa semibrunnea* Buckton. Mon. Memb., 174, pl. 36, fig. 6.

Common. Often found in gardens on cultivated plants. Easily recognized by the black undersurface of the body which is a sufficient specific character for separation from other local species of the genus and has suggested several synonyms as above. One of the last of the membracids to appear in the summer since the eggs do not usually hatch before the first of July and adults are not common in the field until the middle of August. Mr. Woodruff reports that the favorite host around Litchfield seems to be clematis.

Hosts: Rose, blackberry, sweet clover, apple, dogwood, thistle, clematis.

East Hartford, 9 Aug., 1904 (P. L. B.); Kent, 10 Aug., 1918 (B. H. W.); Litchfield, Aug. and Sept. (L. B. W.); Cornwall, 16 Aug., 1920 (K. F. C.).

C. palmeri Van Duzee.

1908. *Ceresa Palmeri* Van Duzee. Can. Ent., xl, 114.

A small species with a decided reddish tinge along the dorsal line of the pronotum, pronotum high and not pubescent, supra-humeral horns short, terete and but little recurved.

Hosts: Young hickory, white oak saplings, red oak, swamp white oak.

Litchfield, Aug. and Sept. (L. B. W.); Hamden, 15 Aug., 1921 (P. G.).

C. borealis Fairmaire.

1846. *Ceresa borealis* Fairmaire. Rev. Memb., 284, No. 5.

Abundant. Found on a wide variety of plants and in a wide range of habitats. May be recognized by its very hairy pronotum. The insect is of rather small size, uniform color, convex pronotum, curved dorsum, and very slightly decurved posterior process. The last ventral segment of the female shows a broad, triangular notch.

The eggs are laid on the smaller twigs and sometimes in the buds of apple, pear, hickory and other trees in August and September. The nymphs appear early in the Spring, often as early as the middle of April, and are rather slow in reaching maturity, the nymphal instars averaging nearly ten days each.

Hosts: Apple, pear, hickory, wild grape, locust, elder, willow, white oak, red oak, pignut, raspberry, blackberry, sycamore, beech, wild cherry, thistle.

Southington, 4 Aug., 1905 (B. H. W.); Wallingford, 31 July, 1912; 3, 9, 10 Aug., 1912 (D. J. C.); Portland, 10 Aug., 1914 (M. P. Z.); Stonington, 4 Aug., 1914 (I. W. D.); Litchfield, July to Sept. (L. B. W.); Branford, 28 July, 1920 (B. H. W.); New Canaan, 26 Aug., 1920 (B. H. W.); Norwalk, 8 Sept., 1920 (B. H. W.); Bridgeport, 20 Sept. 1920 (B. H. W.).

C. taurina Fitch. (Pl. iv, 7.)

1835. *Membracis taurina* Harris. Cat. Ins. Mass., 579 (MS. name).

1856. *Ceresa taurina* Fitch. Rept. Ins. N. Y., iii. 335 (description).

Very common. Usually associated with, and for many years confused with the next species, *C. bubalus*, from which it is to be distinguished by the very different shape of the metopidium, the long, sharp, curving horns, and the longer apical ventral segment of the female.

The species has a wide range of hosts but is perhaps most often taken on apple.

The life history has been described in detail by Hodgkiss (Hodgkiss, H. E., New York Agr. Sta. Tech. Bull. 17, 1910) and by Funkhouser (*Membracidae of the Cayuga Basin*. pp. 226-227. 1917).

Hosts: Apple, pear, raspberry, hickory, potato, blackberry, dahlia (cultivated), hazelnut, locust, witchhazel, white oak, red oak, sweet clover, bittersweet, red clover, beech, morning glory, thistle.

Berlin, 16 Sept., 1915 (W. E. B.); New Haven, 9 Oct., 1903 (W. E. B.); 17 July, 1908 (B. H. W.); Wallingford, 25 July, 1910, 24, 27, 29, 31 July, 7, 8, 14 Aug., 1912 (D. J. C.); 26 July, 1911 (J. K. L.); Litchfield, July to Sept. (L. B. W.); Cornwall, 18 July, 1921 (B. H. W.).

C. bubalus (Fabricius). Buffalo Tree Hopper. (Pl. iv, 8; egg scars, pl. xix, 5.)

1794. *Membracis bubalus* Fabricius. Ent. Syst., iv, 14, No. 22.

1803. *Centrotus bubalus* Fabricius. Syst. Rhyng., 20, No. 18.

1851. *Ceresa bubalus* Walker. List Hom. Brit. Mus., 531.

The largest, most abundant, and best known species of the genus in the United States. Nearly two hundred references to this species have been recorded in literature (Cf. Memoir 11, Cornell Univ. Agr. Exp. Sta., pp. 219-224, June 1917) but a considerable number of these references doubtless refer to *C. taurina* and *C. borealis*, with which the species was often confused by early entomologists.

Ceresa bubalus may be recognized by its large size, heavy robust body, uniform green color, broadly convex metopidium, and short heavy suprahumeral horns which point directly outward.

It has the widest range of hosts of any of the local membracids and is found commonly on grasses and low shrubs. The eggs are usually laid in September on two or three year old twigs of young trees, particularly elm and apple, and hatch early in May. The egg-slits are of a peculiar crescent shape and are placed close together so that occasionally the twigs are badly scarred. The

nymphs migrate, shortly after hatching, to succulent weeds—sweet clover and joe-pye weed being favorite hosts—on which they feed while completing their development. The adult females then migrate back to the trees for ovipositing. This species has been accused of doing considerable damage to young trees by the mechanical injury due to oviposition. Mr. Woodruff's field notes record that it seems to prefer host plants of damp localities.

Hosts: Elm, apple, pear, sycamore, aster, poplar, potato, butter-nut, hazelnut, sumac, white oak, red oak, black oak, locust, willow, elder, sweet clover, hickory, pignut, joe-pye weed, bulrush (*Scirpus pungens*), boneset, swamp white oak.

Hartford, 2 Oct., 1913 (W. E. B.); Branford, 29 July, 1904 (P. L. B.); Aug., 1905 (H. W. W.); East Hartford, 9 Aug., 1904 (P. L. B.); Stafford, 23 Aug., 1905 (W. E. B.); Wallingford, 3 Aug., 1910, 8, 14 Aug., 1912 (D. J. C.); Manchester, 30 Aug., 1912 (D. J. C.); New Haven, 27 Aug., 1 Sept., 1914 (W. E. B.); 1 Aug., 1916 (M. P. Z.); New Canaan, 19 Sept., 1919 (B. H. W.); 16 Sept., 1913 (W. E. B.); 29 Sept., 1909 (I. W. D.); 29 Sept., 1910 (D. J. C.); Portland, 15 Aug., 1913; Mystic, 25 July, 1915 (B. H. W.); Litchfield, Sept. (L. B. W.).

C. brevis Walker.

1851. *Ceresa brevis* Walker. List Hom. Brit. Mus., ii, 528.

Rare. Only two records from Connecticut and taken but few times in neighboring States.

A distinct little species of a bright green color above but slightly marked with black at the bases of the legs and on sides of femora. Distinguished by the shape and position of the suprahumeral horns which are long, acute and slightly curved backward.

The life history and hosts are unknown.

New Haven, 20 Aug., 1909 (A. I. B.); Litchfield, Sept. (L. B. W.).

C. brevicornis Fitch.

1856. *Ceresa brevicornis* Fitch. Third Rept. Ins. N. Y., 451. 177.

Rare. A number of the references to this species in literature probably refer to *C. brevis* or *C. borealis*.

Ceresa brevicornis is near *C. brevis* but differs in having the suprahumeral short and blunt. The species is small, of a uniform green color; the vertex is plainly marked with longitudinal striae and the clypeus projects well below the lateral borders of the head.

The life history and hosts are unknown.

New Haven, 12 July, 1905 (B. H. W.); 7 Aug., 1905 (W. E. B.); Scotland, 8 Aug., Canterbury, 14 Aug., 1905 (B. H. W.).

C. constans (Walker).

1851. *Thelia constans* Walker. List Hom. Brit. Mus., ii, 563.

1869. *Ceresa constans* Stål. Bid. Memb. Kan., 245.

Probably rare. The writer has taken it rather commonly in New York State on locust but Mr. Woodruff has taken it in Connecticut only on oak (species not recorded).

The species may be recognized by its small size, reddish carina and long, recurved horns.

The life history is not known.

Hosts: Locust, oak.

Litchfield, Aug. and Sept. (L. B. W.); New Haven, 26 July, 18 Sept., 1921 (B. H. W.).

Stictocephala Stål.

This genus is close to *Ceresa* but may be distinguished superficially by the absence of suprahumeral horns. This character, as has been pointed out by Van Duzee (Studies in North American Membracidae, p. 41), is an entirely superficial one and does not hold good in the comparison of the two genera as entities since there is a gradation between the horned and hornless species, but it serves perfectly in separating the genera in Connecticut since the intermediate forms do not occur in this fauna. A more natural character is the difference in the genital apparatus pointed out by Fowler (Biologia Centrali-Americana, ii: 1. p. 97. 1894) and apparently good in generic diagnosis.

The two species of the genus to be found in Connecticut may be distinguished as follows:

Size large; color uniform green *inermis*
Size small; undersurface of body black *lutea*

S. inermis (Fabricius).

1775. *Membracis inermis* Fabricius. Syst. Ent., iv, 678, No. 1.
1831. *Membracis goniphora* Say. Jour. Acad. Nat. Sci. Phila., v, 243.
1851. *Ceresa goniphora* Walker. List. Hom. Brit. Mus., 1141.
1851. *Smilia inermis* Fitch. Cat. Ins. N. Y., 48.
1869. *Stictocephala inermis* Stål. Bid. Memb. Kan., 246.

A fine large species very abundant throughout eastern United States on clovers and grasses and usually taken in sweeping.

The eggs are laid in the young stems of apple just beneath the bark in groups of four or five. The egg puncture is a ragged one and fails to heal smoothly, leaving a characteristic scar which has been well figured by Hodgkiss (The Apple and Pear Membracids, p. 98). Oviposition occurs over an extended period during July, August and September. The eggs winter over and hatch about the first of May. Almost immediately the nymphs migrate to the grass and weeds where they spend most of their lives, the mature females returning to the apple to oviposit. The complete life history of a closely related species, *S. festina*, has been worked out by Wildermuth (Wildermuth, V. L., Journ. Agr. Research, iii, 343-362. 1915) and the life history of *S. inermis* is probably very similar.

Hosts: Sweet clover, red clover, white clover, timothy, apple.

Hamden, 18 July, 1920 (B. H. W.).

S. lutea (Walker). (Pl. iv, 10.)

1851. *Thelia lutea* Walker. List Hom. Brit. Mus., ii, 559.
 1851. *Thelia inermis* Walker. List Hom. Brit. Mus., 1142.
 1854. *Gargara pectoralis* Emmons. N. Y. Agr. Rept., v, 157.
 1869. *Stictocephala lutea* Stål. Hem. Fabr., ii, 24.

Very abundant. Found chiefly on trees, particularly various species of oaks. Less common on grasses, in which respect it differs from the preceding species. One of the most interesting of the records from Connecticut is the taking of the insect on white pine at Portland by F. W. Haasis, June 1, 1915. Very few membracids have ever been reported from any of the conifers.

The life history is not known but apparently its habits are quite different from those of *S. inermis*.

Hosts: White oak, red oak, black oak, white pine, daisy.

New Haven, 13, 24, 28 June, 1902 (E. J. S. M.); 15, 22 May, 1903 (B. H. W.); 8 June, 1904 (W. E. B.); 21 May, 1910 (A. B. C.); 9 June, 1914 (Q. S. L.); Westville, 4 July, 1904 (W. E. B.); Hamden, 2 June, 1911 (A. B. C.); North Branford, 8 June, 1912 (B. H. W.); Stonington, 8 May, 1914 (I. W. D.); Portland, 5 June, 1914 (M. P. Z.); 1 June, 1915 (F. W. Haasis); Mount Carmel, 25 May, 1906 (B. H. W.); Litchfield, 31 May (L. B. W.); Killingworth, 27 June, 1920 (W. E. B.).

Acutalis Fairmaire.

This genus is represented in Connecticut by at least two species. The genus is characterized by the small size of the insects, the dark and shining pronotum, and the five apical cells of the tegmina set off by distinct veins.

Key to Species.

- Tegmina black and opaque, veins black and heavy**tartarea**
 Tegmina hyaline, veins thinner and lighter**semicrema**

A. tartarea (Say).

1830. *Membracis tartarea* Say. Jour. Acad. Nat. Sci. Phila., vi, 242.
 1851. *Ceresa tartarea* Walker. List Hom. Brit. Mus., 1141. 34.
 1876. *Acutalis tartarea* Uhler. List Hem. West Miss. Riv., 345. 1.

Not common in the New England States but occasionally reported from eastern New York and from Massachusetts. In the central and southern states, where it is abundant, it is taken on both trees and annuals but its life history has not been worked out. In Mississippi it is common on pecan; in Kentucky its favorite hosts seem to be wormwood and soapwort.

The insect is small and elongate (length 4.5 mm.; max. width 2 mm.), pronotum and tegmina very black but sometimes showing a hyaline apex to the tegmen and a white lateral margin on the pronotum.

Cornwall, 17 July, 1921 (B. H. W.).

A. semicrema (Say).

1830. *Membracis semicrema* Say. Jour. Acad. Nat. Sci. Phila., vi, 242. 2.
 1846. *Acutalis anticonigra* Fairmaire. Rev. Memb., 498. 7.
 1851. *Ceresa semicurva* Walker. List Hom. Brit. Mus., 1141. 35.
 1872. *Tragopa brunnea* Provancher. Nat. Canad., iv, 320.
 1876. *Acutalis semicrema* Uhler. List Hem. West Miss. Riv., 345. 2.

Van Duzee (Catalogue of Hemiptera, p. 529) considers this a variety of the preceding and such may prove to be the case.

This form is abundant throughout eastern United States and is common in New England as indicated by locality records.

It may be distinguished from *A. tartarea* by the hyaline tegmina with thin veins and by the fact that in *semicrema* only the anterior part of the pronotum is black, the posterior half being green or greenish, so that the general appearance of the insect suggests its specific name.

Very little is known of its life history.

Hosts: Hop-tree, giant ragweed, locust, white oak, soapwort.

Cornwall, 17 July, 1921 (M. P. Z., B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.).

Micrutalis Fowler.

Closely related to the preceding genus but distinguished by having only four apical cells in the tegmina with the veins very obscure. Two species are found in the State.

Key to Species.

Size large, 4-5 mm.; anterior part of pronotum black *dorsalis*

Size small, less than 4 mm.; entire pronotum usually black *calva*

M. dorsalis (Fitch).

1851. *Tragopa dorsalis* Fitch. Cat. Ins. N. Y., 52.

1856. *Acutalis dorsalis* Fitch. Rept. Ins. N. Y., iii, 390.

1903. *Horiola dorsalis* Buckton. Mon. Memb., 158.

1908. *Micrutalis dorsalis* Van Duzee. Stud. N. A. Memb., 53.

The commonest and largest species of the genus. The first Connecticut record which has been seen for the species was that by Mr. Woodruff whose field notes record that it was taken while "beating clematis." Its life history is not known.

Hosts: Locust, wild grape, hickory, clematis.

Litchfield, 17 Aug., 1912 (L. B. W.); Cornwall, 17 July, 1921 (M. P. Z., B. H. W.).

M. calva (Say). (Pl. iv, 11.)

1831. *Membracis calva* Say. Jour. Acad. Nat. Sci. Phila., vi, 242.

1834. *Membracis melanogramma* Perty. Del. An. Art., pl. 35, fig. 10.

1835. *Smilia flavipennis* Germar. Silb. Rev., iii, 240.

1846. *Acutalis flavipennis* Fairmaire. Rev. Memb., 497, No. 5.

1851. *Ceresa calva* Walker. List Hom. Brit. Mus., 1141.

1851. *Acutalis melanogramma* Walker. List Hom., Brit. Mus., 591.

1856. *Acutalis calva* Fitch. Rept. Ins. N. Y., iii, 391.

1893. *Acutalis Illinoiensis* Godging. Can. Ent., 25, 53.

1907. *Micrutalis calva* Baker. Can. Ent., 39, 116.

Common. Very minute, 3-3.5 mm.; one of the smallest species of Membracidae in the United States; usually strongly marked with black although the color is variable; pronotum shining; abdomen yellowish; tegmina hyaline, veins very indistinct.

Hosts: Wormwood (especially the species *Artemisia annua*), soapwort, sycamore, red-bud.

New Haven, 20 Aug., 1909 (B. H. W.); Portland, 15 Aug., 1913 (B. H. W.); Hartford, 22 June, 1914 (Mrs. W. Seliger); Stratford, 9 July, 1921 (B. H. W.); North Haven, 4 Sept., 1921 (B. H. W.).

Carynota Fitch.

The genus is distinguished by the low, smooth, rounded pronotum which is without crest or horns and is produced downward at the sides to cover at least two-thirds of the tegmina, the sessile terminal cells of the hind wings, and the hairy and robust appearance. The species of this genus are fine large insects and show distinctive markings. Three species are represented.

Key to Species.

1. Small; brown with yellow markings 2
Larger; gray with a bright brown band behind middle *mera*
2. Very light brown; yellow markings prominent; dorsum strongly sinuate behind middle *porphyrea*
Very dark brown, almost black; yellow dots obscure; dorsum feebly and regularly arcuate *stupidia*

C. *mera* (Say). (Pl. iv, 12.)

1831. *Membracis mera* Say. Jour. Acad. Nat. Sci. Phila., vi, 310.

1851. *Carynota mera* Fitch. Cat. Ins. N. Y., 48.

1854. *Gargara majus* Emmons. N. Y. Agr. Rept., v, 156, pl. 13, fig. 6.

1856. *Ophiderma mera* Fitch. Rept. Ins. N. Y., iii, 465.

1894. *Carynota strombergi* Goding. Cat. Memb. N. A., 443.

Very common throughout eastern United States on hickory and butternut in the North and on white oak and pecan in the South.

The insects are large (females 10 mm.; males 8.5 mm.); ground color gray, with a rich brown or chestnut band across the pronotum behind the middle, and the apex of the posterior process brown; pronotum convex and elevated; tegmina fuscous-hyaline tipped with dark brown.

The eggs are laid on hickory or butternut in late Summer, hatch about the middle of the following June, and the insects reach maturity about the middle of July. The entire life is spent on one host.

Hosts: Hickory, butternut, white oak, pecan, red oak, basswood.

Wallingford, 5, 15, 20, 24, 31 July, 3, 7 Aug., 1912 (D. J. C.); Hamden, 15 July, 1918 (M. P. Z.); Litchfield, July to Sept. (L. B. W.); Portland, 15 July, 1920 (B. H. W.).

C. *porphyrea* (Fairmaire).

1846. *Thelia porphyrea* Fairmaire. Rev. Memb., 306, No. 4.

1867. *Optilete porphyrea* Stål. Bid. Memb. Syst., 556, pl. 2, fig. 22.

1908. *Carynota porphyrea* Van Duzee. Stud. N. A. Memb., 57.

Not common. A smaller species than the preceding (females not over 8 mm., and males slightly smaller) and distinguished by the markings. The ground color is brown, irregularly dotted with yellow, with a broad transverse yellow band at the base of the posterior process; the dorsum is higher and more arched than

in *C. mera* and the posterior process is shorter. The life history is not known.

Host: White oak.

Lyme, 20 Aug., 1910; Portland, 13 Aug., 1913 (B. H. W.); Litchfield, 22 July, 1920 (M. P. Z.).

C. stupida (Walker).

1851. *Darnis stupida* Walker. List Hom. Brit. Mus., ii, 577, No. 16.

1878. *Hypheus stupidus* Butler. Cist. Ent., ii, 343.

1894. *Carynota muskokensis* Goding. Cat. Memb. N. A., 444. 145.

1903. *Hypheus albopicta* Buckton. Mon. Memb., 135. Pl. 29, figs. 1, 1a.

1913. *Carynota stupida* Gibson. Rept. Ent. Soc. Ont., 135, No. 43.

Probably common. May be distinguished from the other species by its small size, very dark color, and by the regularly arcuated dorsal margin of the pronotum.

The life history is unknown. In the original description of *Carynota muskokensis*, Goding gives as a questionable food-plant *Populus grandidentata*.

Host: Large-toothed aspen (?).

Pleasant Valley, Litchfield, 5 Sept., 1915 (G. P. Engelhardt).

Thelia Amyot and Serville.

A genus characterized by the porrect pronotal horn. Only one species is common in the eastern United States but this species is so abundant that it is very well known.

T. bimaculata (Fabricius). (Pl. iv, 14, 15 and 16.)

1794. *Membracis bimaculata* Fabricius. Ent. Syst., iv, 10, No. 11.

1843. *Thelia bimaculata* Amyot and Serville. Hem., 541.

1851. *Thelia unaninus* Walker. List. Hom. Brit. Mus., 566.

Extremely abundant on locust. It apparently inhabits only the locust and only one species of this tree (*Robinia pseudacacia*) but occurs in great numbers. It is not unusual to collect several hundred individuals from one small locust sapling.

The species is easily recognized by the large size, the porrect pronotal horn and the brilliant yellow markings of the male which have suggested the specific name. The female is gray with indistinct darker irregular markings, cylindrical horn slightly flattened and darker at the tip, hyaline tegmina with fuscous tips which extend almost to the extremity of the posterior process. The female is about 11 mm. long (including horn, 14 mm.) and 5.5 mm. wide between the humeral angles. The male is smaller and less robust, and has a wide, brilliant lemon-yellow longitudinal stripe on each side of the prothorax.

The life history of the species has been described in detail (Annals Ent. Soc. Amer., viii, pp. 140-151, 1915) and is interesting in that the eggs are often laid at the roots of the tree just below the surface of the forest litter. The species is largely attended by ants.

Host: Locust.

Middlefield, 1906 (W. R. Coe); Wallingford, 22, 29, July; 2, 7, 8, 12 Aug., 1912 (D. J. C.); New Haven, 1 Aug., 1920 (B. H. W.).

Glossonotus Butler.

The characters of this genus are entirely artificial, being based on the position and form of the pronotal crest which unfortunately is much inclined to vary. Theoretically this crest is tongue-shaped, erect, and placed well forward. Four species are recorded from Connecticut.

Key to Species.

- | | |
|--|--------------------|
| 1. Dorsum with white median posterior vitta | 2 |
| Dorsum without white median posterior vitta | 3 |
| 2. Horn long, slender, projecting somewhat forward | <i>univittatus</i> |
| Horn short, thick, vertical | <i>godingi</i> |
| 3. Light brown with large pale markings | <i>crataegi</i> |
| Very dark brown without markings | <i>acuminatus</i> |

G. univittatus (Harris).

1841. *Membracis univittata* Harris. Rept. Ins. Mass., 180.
 1851. *Enchenopa univittata* Walker. List Hom. Brit. Mus., 494.
 1851. *Thelia univittata* Fitch. Cat. Ins. N. Y., 52.
 1908. *Glossonotus univittatus* Van Duzee. Stud. N. A. Memb., 59.

Common. A large attractive species recognized by the long slender horn which inclines slightly forward, uniform in width and not expanded at the tip, and the white dorsal vitta extending down the posterior median dorsal line. The tegmina are smoky hyaline, clouded with brown at the tips and sparingly punctate at bases and along margins of veins.

The life history has not been worked out. Mr. Woodruff reports that he has taken the species in Connecticut on black oak and chestnut and also on yellow birch near a chestnut woods.

Hosts: Hazelnut, swamp white oak (*Quercus bicolor*), hickory, black oak (*Q. velutina*), chestnut, yellow birch.

New Haven, 11 July, 1918 (M. P. Z.); Litchfield, Aug. (L. B. Woodruff).

G. godingi (Van Duzee).

1894. *Thelia godingi* (nom. nud.) Van Duzee. Bul. Buff. Soc., v, 189.
 1895. *Glossonotus Godingi* Van Duzee. Ent. News, vi, 203.
 1903. *Telamona dorsalis* Buckton. Mon. Memb., 197. Pl. 43, figs. 3-3b.
 1908. *Telamona godingi* Felt. Seventh Rept. N. Y. Forest, Fish and Game Commission, 529.

Apparently the most common species of the genus in Connecticut. Mr. Woodruff reports it most abundant on red oak but has taken it also on white oak, chestnut, and on yellow birch growing near chestnut.

A short, heavy-bodied species, usually chocolate-brown in color but sometimes grading into darker browns, with a broad whitish or yellowish vitta down the posterior dorsal median line. The

crest is short, broad, flattened, and usually nearly vertical and is sometimes swollen at the tip.

Hosts: Red oak, white oak, chestnut, yellow birch.

New Haven, 24 Aug., 1914 (W. E. B.); 30 June, 1916 (M. P. Z.); Lyme, 16 June, 1918 (M. P. Z.); Litchfield, July and Aug. (L. B. W.); Hamden, 11 June, 1921 (B. H. W.).

G. crataegi (Fitch).

1851. *Thelia crataegi* Fitch. Cat. Ins. N. Y., 52.

1854. *Telamona crataegi* Emmons. N. Y. Agr. Rept., v, 155. Pl. 3, fig. 2.

1890. *Thelia pyramidoides* Smith. Ins. N. J., 441.

1908. *Glossonotus crataegi* Van Duzee. Stud. N. A. Memb., 59.

Very common. Usually abundant on quince wherever this fruit is grown in the eastern states.

Near the preceding species in size and shape but at once recognized by the very characteristic markings. The entire pronotum is strikingly decorated with areas of chestnut-red, pale whitish yellow, and deep brown. The crest is erect, broad, flattened, and dark in color. The legs are very hairy.

The species apparently spends its entire life on one host but the life history is not completely known.

Hosts: Quince, hawthorn, crab-apple, rose (cultivated), pear.

Wallingford, 5 Aug., 1912 (D. J. C.); Litchfield, July (L. B. W.).

G. acuminatus (Fabricius). (Pl. iv, 13.)

1781. *Membracis acuminata* Fabricius. Spec. Ins., ii, 317, No. 6.

1788. *Cicada acuminata* Gmelin. Ed. Syst. Nat., ii, 2094.

1803. *Centrotus acuminata* Fabricius. Syst. Rhyng., 18, No. 9.

1846. *Thelia acuminata* Fairmaire. Rev. Memb., 310, pl. 5, fig. 15.

1862. *Hemiptycha acuminata* Harris. Treatise, 221.

1869. *Telamona acuminatus* Stål. Hem. Fabr., ii, 115.

1877. *Glossonotus acuminata* Butler. Cist. Ent., ii, 222.

Not common. Has been collected in New York State on white oak but Mr. Woodruff reports that he has taken it almost invariably on black oak (*Q. velutina*).

A fine large species, dark gray mottled with brown, and distinguished by the very long flattened crest which is almost as high as the insect is long and is usually swollen at the tip. The humeral angles are prominent and triangular; the tegmina are hyaline, tipped with brown.

Hosts: Black oak, white oak.

New Haven, 10 July, 1919 (W. E. B.); 6 July, 1914 (B. H. W.); Stonington, 13 July, 1914 (I. W. D.).

Heliria Stål.

Heliria is a genus of rather doubtful standing, the characters, like those of *Glossonotus*, depending on the shape of the pronotal crest, which is supposedly step-shaped. No species of this genus have been found in the State but the two following should occur:

Key to Species.

- Large (12-13 mm.); gray; crest longer than high**cristata**
 Small (7-8 mm.); brown; crest higher than long**scalaris**

H. cristata (Fairmaire).

1846. *Thelia cristata* Fairmaire. Rev. Memb., 311, No. 19.
 1851. *Telamona fagi* Fitch. Cat. Hom. N. Y., 51. 687.
 1854. *Telamona acclivata* Emmons. Agr. N. Y., v, 155, pl. 3, fig. 5.
 1867. *Heliria cristata* Stål. Bid. Hem. Syst., 556.
 1896. *Telamona cristata* Fowler. B. C. A. 144. 3. Tab. 9, figs. 6, 6a.

Probably rare but found in New York, Massachusetts and New Jersey. A fine large species, the type of the genus. The body color is gray with irregular brown markings. The crest is large and shows the very characteristic "step" on the dorsal margin, the anterior half of the crest being twice as high as the posterior, with the posterior angle very acute. The humeral angles are greatly produced.

Hosts and life history unknown.

H. scalaris (Fairmaire).

1846. *Thelia scalaris* Fairmaire. Rev. Memb., 311, 18, pl. 5, fig. 14.
 1867. *Heliria scalaris* Stål. Bid. Hem. Syst., 556.
 1877. *Telamona scalaris* Butler. Cist. Ent., ii, 222.

Should be common according to eastern locality records but has not yet been reported from the State.

A small species, uniform brown in color, crest as high or higher than long, posterior process not reaching apices of the tegmina which are smoky hyaline with brown tips.

Hosts and life history unknown.

Telamona Fitch.

Practically all of the species of this genus have been described from pronotal characters only, and as such characters are decidedly variable and not always dependable, the diagnosis of species is often difficult. The following key is admittedly artificial but it is believed will be sufficient to distinguish the species included, most of which are apparently distinct and rather well known.

Key to Species.

1. Crest slender, pointed at tip 2
 Crest broad, rounded or truncate at tip 3
2. Crest highest in front **declivata**
 Crest highest in middle **barbata**
3. Hind margin of crest perpendicular or falcate 4
 Hind margin of crest sloping 5
4. Posterior dorsal angle of crest sharp **subfalcata**
 Posterior dorsal angle of crest rounded **dubiosa**
5. Front margin of crest perpendicular or nearly so 6
 Front margin of crest sloping 11
6. Humeral angles not twice the length of the eye 7
 Humeral angles more than twice the length of eye **maculata**

- | | | |
|-----|--|--------------|
| 7. | Color green or greenish testaceous (or yellow in males only) ... | 8 |
| | Color not green or greenish | 9 |
| 8. | Females bright green; males yellow banded with brown | unicolor |
| | Both sexes greenish testaceous | extrema |
| 9. | Posterior margin of crest not white | 10 |
| | Posterior margin of crest white | monticola |
| 10. | Yellow, mottled with brown | tristis |
| | Gray, with transverse brown band | ampelopsidis |
| 11. | Crest broader than high | 12 |
| | Crest as high or higher than broad | querci |
| 12. | Gray, with oblique brown fascia | 13 |
| | Brown, banded with darker | reclivata |
| 13. | Posterior process not reaching tips of tegmina | decorata |
| | Posterior process extending beyond tips of tegmina | sinuata |

T. declivata Van Duzee.

1908. *Telamona declivata* Van Duzee. Stud. N. A. Memb., p. 64.

Probably rare. Easily recognized by the very peculiar shape of the crest which is not only pointed but is much higher in its anterior half than in its posterior half, making a step suggestive of the genus *Heliria*. The pronotum is long and narrow, the posterior process exceeding the tegmina in length, the tegmina smoky hyaline, punctate at bases and clouded with brown at tips.

There is no host record and the life history is not known.

New Haven, 30 July, 1901; Hartford, 12 Sept., 1907 (W. E. B.).

T. barbata Van Duzee.

1908. *Telamona barbata* Van Duzee. Stud. N. A. Memb., p. 65.

Rare. A small brownish species with a weak pyramidal crest which is darker than the rest of the pronotum. The color is mottled greenish brown. The posterior process does not reach the tips of the tegmina which are smoky hyaline with apices broadly clouded.

The habits of this species are not well known. The writer has previously reported the species (Membracidae of Cayuga Lake Basin, p. 252. 1917) as having been taken on white oak and basswood. Mr. Woodruff has collected males, which agree in every respect with the types of *barbata* in the Cornell collection, on white oak with females of what is apparently *decorata*. Dr. E. D. Ball insists, however (in correspondence), that *barbata* is not an oak or basswood species, and writes under date of December 19, 1917: ". . . . what *barbata* is may not be settled as yet but it is *not* a white oak or basswood species." It is evident, therefore, that there is still much to be learned concerning this species.

Litchfield, 27 June, 1914, also July and Aug. (L. B. W.).

T. subfalcata Van Duzee.

1912. *Telamona subfalcata* Van Duzee. Bul. Buff. Soc., x, p. 509.

This species was described from the Southern States but has been collected in New York and has been taken on white oak at Litchfield by Mr. Woodruff.

It is easily recognized by the subfalcate posterior margin of

the crest. The body color is gray with brown fascia; the front of the crest is gradually sloping; the posterior process is short and heavy, not reaching the tips of the tegmina which are hyaline with a prominent brown area at the apices.

Hosts: White oak, swamp white oak.

Litchfield, 19 July, 1913 (L. B. W.).

T. maculata Van Duzee. (Pl. iv, 17.)

1908. *Telamona maculata* Van Duzee. Stud. N. A. Memb., 72. 18, pl. 2, figs. 8 and 41.

Not common. Recognized at once by the extremely produced suprahumeral angles which are twice as long as in any of the other local species of *Telamona*. The crest is almost perpendicular in front, obliquely truncate or rounded above, and nearly straight behind. The metopidium is strongly marked with brown at the base of the crest on each side.

The life history is not known, but it seems to spend its entire life on swamp oak.

Hosts: Swamp white oak (*Q. bicolor*), white oak (*Q. alba*).

New Haven, 1 Sept., 1912; 30 July, 1913 (W. E. B.).

T. unicolor Fitch. (Pl. iv, 19 and 20.)

1851. *Telamona unicolor* Fitch. Cat. Ins. N. Y., 50.

1851. *Telamona fasciata* Fitch. Cat. Ins. N. Y., 50.

1858. *Hemiptycha diffusa* Walker. List Hom. Brit. Mus. Suppl., 143.

Common on hickory and often found on butternut and walnut. The females are large and of a brilliant grass-green uniform color; the males are smaller, of a bright yellow color with deep brown fascia. This difference led Fitch to describe the two sexes as separate species and the specific name is decided only by the fact that the description of *unicolor* precedes that of *fasciata* on the page. The insects are very active, strong fliers, and are at once recognized by their large size (10 mm.) and high, square crest. The tegmina are tipped with brown.

The life history has been worked out on the hickory on which the eggs are laid during September. Hatching takes place about the middle of May and the insects reach maturity the last of June. The nymphal instars average, respectively, ten, six, five, ten and fourteen days. Mating has been observed throughout August and September. The males seem to be much less numerous than the females.

Hosts: Hickory, butternut, walnut, basswood.

New Canaan, 10 Sept., 1914 (B. H. W.); Wallingford, 22, 24 June, 3, 15, 24 July, 1912 (D. J. C.); Rainbow, 5 July, 1918 (M. P. Z.); Litchfield, July to Sept. (L. B. W.); Cornwall, 16 June, 1921 (K. F. C.).

T. extrema Ball.

1903. *Telamona extrema* Ball. Proc. Biol. Soc. Wash., xvi, 179. Pl. 1, figs. 1-16.

Rare in eastern United States. The species resembles *T. unicolor* but is smaller and both sexes are uniformly dull greenish

testaceous in color. The crest is very high and almost square with a whitish vitta on the posterior margin. The tegmina are tipped with brown and there is sometimes a brownish or fuscous spot on the metopidium above each eye and another below each humeral angle.

The life history is not known.

Hosts: White oak, red oak.

Portland, 14 July, 1914 (M. P. Z.).

T. monticola (Fabricius).

1803. *Membracis monticola* Fabricius. Syst. Rhyng., 7, No. 4.

1869. *Telamona monticola* Stål. Hem. Fabr., ii, 115.

1903. *Telamona brunneipennis* Buckton. Mon. Memb., 197, pl. 43, figs. 1, 1a.

Not common. A large robust species; concolorous brown, spotted with greenish; dorsal crest high, rounded, greenish or whitish posteriorly; posterior process not reaching tips of tegmina; tegmina punctate at base, brown at tips.

There is one specimen in the collection of the Connecticut Agricultural Experiment Station without date or locality label which was presumably collected in the State.

Hosts: White oak, swamp white oak.

T. tristis Fitch.

1851. *Telamona tristis* Fitch. Cat. Ins. N. Y., 51.

1851. *Telamona coryli* Fitch. Cat. Ins. N. Y., 51.

1894. *Telamona spreta* Goding. Cat. Memb. N. A., 417.

Presumably common in Connecticut on white oak but has seldom been reported. Described from New York and has been often reported from Pennsylvania, New York and New Jersey northward to Canada.

A small well-marked species with high square crest which is higher before than behind and is distinctly marked anteriorly with fuscous and posteriorly with a brown vitta which breaks at the base and then runs straight to the lateral margins. The whole pronotum is rather conspicuous because of its mottled colors. The tegmina are hyaline with the bases opaque and punctate and the tips brown.

Hosts: White oak, hazel, witchhazel, basswood, black oak, red oak.

New Haven, 6 July, 1904 (H. L. V.).

T. ampelopsidis (Harris).

1833. *Membracis cissi* Harris. List. Ins. Mass. (MS. name).

1841. *Membracis ampelopsidis* Harris. Rept. Ins. Mass., 180.

1846. *Thelia cyrtops* Fairmaire. Rev. Memb., 310. 17. Pl. 5, fig. 13.

1851. *Telamona ampelopsidis* Fitch. Cat. Ins. N. Y., 51.

1877. *Telamona cyrtops* Butler. Cist. Ent., ii, 222, No. 11.

Very abundant on Virginia creeper (*Psedera quinquefolia*) formerly placed in the genus *Ampelopsis* from which the specific name of the insect was derived. Probably the commonest species

of *Telamona* in the State. Since it seems to be limited in host to the Virginia creeper and very few, if any, other species of the genus inhabit this plant, it may be fairly surely identified by its habitat. Mr. Woodruff reports that in Connecticut it seems to be very common some years and not taken at all during others.

This is a large, robust, well-marked species with a high crest which is erect with the front margin nearly perpendicular and the hind margin sloping. The ground color of the pronotum is grayish with brown transverse fascia across the metopidium, a deep brown area at the frontal base, and a brown fascia extending from the posterior tip of the crest to the lateral margin of the pronotum. The tegmina are hyaline with brown tips. The males are in most cases smaller and darker than the females and in some instances are solid black in color.

The eggs are laid deeply in the axils of the leaves and hatch in early June. The nymphs require about five weeks to reach maturity. Mating begins about the middle of July and oviposition almost immediately afterward. The entire life history is apparently spent on the one host.

Wallingford, 3 Aug., 1912 (D. J. C.); Stonington, 2 July, 1914; 4 Aug., 1914 (I. W. D.); New Haven, 2 July, 1914 (W. E. B.); Litchfield, Aug. (L. B. W.).

T. querci Fitch. (Pl. iv, 18.)

1851. *Telamona querci* Fitch. Cat. Ins. N. Y., 51.

Abundant on various species of oaks. Particularly common on small white and chestnut oaks on hillsides in sunny places.

This species is close to *T. monticola* Fabr., but may be distinguished by the shorter darker pronotum and by the prominent white vitta along the posterior median line of the dorsal crest. The tegmina are nearly hyaline with the tips faintly clouded.

The insect is solitary in habit and quick in movement. The nymphs are most often found on the outer branches and in the axils of the leaves while the adults seem to prefer the twigs of second-year growth. The life history has not been entirely worked out.

Hosts: White oak, chestnut oak, black oaks (*Q. nigra* and *Q. velutina*), red oak.

Portland, 14 July, 1914 (M. P. Z.); Litchfield, June to Aug. (L. B. W.); New Haven, 27 June, 1920 (W. E. B.); 18 June, 1921 (B. H. W.).

T. reclinata Fitch.

1851. *Telamona reclinata* Fitch. Cat. Ins. N. Y., 51.

Very abundant on basswood and apparently almost as strictly limited to this host as *T. ampelopsidis* is to Virginia creeper.

This is a rather difficult species to delimit owing to the variation in the shape of the pronotal crest. It may be generally recognized, however, by the large size, the rounded sloping crest, the long posterior process and the dark brown markings. The tegmina

are hyaline and the abdominal segments are brown, margined with paler.

The nymphs are found on the same host as the adult and apparently the time of oviposition and hatching is extended over a considerable period since all stages may be collected at the same time during most of July and August.

Host: Basswood.

Wallingford, 22 June, 1912 (D. J. C.).

T. decorata Ball.

1903. *Telamona decorata* Ball. Proc. Biol. Soc. Wash., xvi, 179. Pl. 1, figs. 6, 6a.

Probably rare but is occasionally found in the State on red oak, the host on which the species was originally described. The writer has previously recorded this insect (Biol. Memb. Cayuga Lake Basin, p. 264) from both red oak and basswood but Dr. E. D. Ball, the author of the species, states (in correspondence) that the latter host must be accidental as the form is not basswood-inhabiting.

The species is very close to *T. reclinata* from which it may be separated by the brown oblique marking extending from the tip of the crest to the lateral margin of the pronotum. The ground color is grayish yellow with the sides of the crest and the above-mentioned band brown. The apex of the posterior process is broadly brown. The tegmina are smoky hyaline with the bases sharply punctate with black, and the apices brown.

Host: Red oak.

Stonington, 3 July, 1914 (I. W. D.); Guilford, 24 July, 1921 (B. H. W.).

T. sinuata Fowler.

1896. *Telamona sinuata* Fowler. Biol. Centr. Amer., 144. 4. Tab. 9, figs. 7, 7a.

This species was described from Mexico and is included by Van Duzee in his Catalogue of Hemiptera as questionably from Arizona. A species which apparently answers Fowler's description and figure in all particulars has been taken by the writer in New York and the same species has been collected by Mr. Woodruff in Connecticut. Either this is a new species so close to Fowler's species that it cannot be distinguished by the characters given in the literature or *T. sinuata* has an extremely wide range. It is here included under Fowler's name.

This is a fine large species, gray, mottled with brown, with an erect well-developed dorsal crest and a long posterior process extending beyond the apices of the tegmina. The life history is not known.

Hosts: Yellow birch (*B. lutea*), white poplar (*P. alba*), quaking aspen (*P. tremuloides*).

Litchfield, July and Sept. (L. B. W.).

T. dubiosa Van Duzee.1894. *Telamona irrorata* Goding. Cat. Memb. N. A., 418. 71.1916. *Telamona dubiosa* Van Duzee. Check List Hem., 59. 1634.

Probably rare. A gray and brown species near the preceding but smaller and with the hind margin of the dorsal crest more nearly perpendicular. Characterized by the irregular brown dots on a gray or sordid yellow background. The tegmina are hyaline with bases and apices clouded with brown.

Host: White oak.

Litchfield, Sept. (L. B. W.).

Archasia Stål.

An interesting genus because it is one of the few in the United States which show the broad, compressed, leaf-like expansion of the pronotum suggestive of the tropical forms of the type genus *Membracis*. The colors of the insects of this genus are not brilliant, however, being usually green or brown with few markings. One species at least is found in Connecticut.

A. belfragei Stål.1869. *Archasia belfragei* Stål. Bid. Memb. Kan., 250.

Probably rare. Easily recognized by the very foliaceous pronotum which is green in life and fades to yellowish in cabinet specimens. The pronotum is high and strongly flattened with the dorsal margin brown. The tegmina are about half concealed by the pronotum and the posterior process does not reach the apices of the tegmina. The life history is not known.

Hosts: Locust, white oak.

Guilford, 13 July, 1920 (B. H. W.).

Smilia Germar.

Somewhat resembling the preceding genus in that the pronotum is compressed and flattened but easily distinguished by the fact that the terminal cell of the hind wing is triangular and petiolate. One species is recorded from the State.

S. camelus (Fabricius). (Pl. iv, 21.)1803. *Membracis camelus* Fabricius. Syst. Rhyng., 10, No. 18.1843. *Smilia vittata* Amyot and Serville. Hem., 539.1846. *Thelia camelus* Fairmaire. Rev. Memb., 308. 7. Pl. 5, figs. 5, 8, 9.1851. *Smilia guttata* Fitch. Cat. Ins. N. Y., 49.1893. *Smilia belulæ* Goding. Can. Ent., xxv, 196.

Common. Perhaps the most brilliantly marked of all of the local species of Membracidae. The ground color of the high flattened pronotum is brown—chocolate in the female and black-brown in the male—with a broad diagonal slash of bright Nile-green extending from the cephalic dorsal apex to the middle of the lateral margin. The pronotum is high and foliaceous and

extends somewhat forward over the head. The tegmina are hyaline with the apices brown. The life history is not known.

Goding has recognized a doubtful variety *viridis* (Bull. Ill. State Lab. Nat. Hist., iii: 426. 1894) which has also been recorded from the State.

Hosts: Locust, red oak, white oak, black oak (*Q. velutina*).

New Haven, 11 June, 1897 (W. C. Sturgis); 11 June, 1914 (B. H. W.); Litchfield, July and Aug. (L. B. W.); Hamden, 20 June, 1920 (B. H. W.).

S. camelus var. *viridis* Goding.

Bull. Ill. St. Lab. Nat. Hist., iii, 426, 1894.

New Haven, 8 June, 1904 (W. E. B.).

Cyrtolobus Goding.

This genus is very large and widely distributed. The species are in great confusion and extremely hard to delimit. The specific characters generally used have been based on the shape and color of the pronotum, both of which are very variable indeed, so that a long series of specimens shows gradations through a number of species as at present recognized.

The genus as a whole may be distinguished by the compressed dorsum and the thin semitransparent spot below the dorsal ridge. The colors are usually dull brown with many irregular markings.

The genus is badly in need of revision but the following species are apparently good and have been collected or should occur in the State:

Key to Species.

1. Dorsum regularly rounded from head, without anterior notch or depression 2
- Dorsum with anterior depression before elevation 4
2. Light (yellow or light green) 3
- Dark with distinct markings *fenestratus*
3. Without markings *ovatus*
- With prominent black markings on metopidium *maculifrontis*
4. Crest arising before humeral angles 5
- Crest arising behind humeral angles 6
5. Color uniform dark brown *fuliginosus*
- Color pale reddish yellow with brown oblique line *arcuatus*
6. Small, not over 7 mm. in length 7
- Larger, at least 9 mm. in length *tuberosus*
7. Crest low or obsolete 8
- Crest well developed 9
8. Tegmina uniform clouded brown *fuscipennis*
- Tegmina marked with whitish *cinereus*
9. Pronotum distinctly marked with oblique bands 10
- Markings obscure or obsolete 12
10. Metopidium and legs concolorous or mottled 11
- Median line of metopidium and tibiae white *inermis* (*male*)
11. Clypeus flat, lateral margins of head sinuate *vau*
- Clypeus very convex, lateral margins of head straight *sculptus*
12. Concolorous and immaculate 13
- Pronotum faintly marked with oblique ray 14

13. Brown *intermedius*
 Green *inermis* (female)
 14. Tegmina hyaline *cinctus*
 Tegmina clouded, tip broadly brown *discoidalis*

C. fenestratus (Fitch).

1851. *Cyrtosia fenestrata* Fitch. Cat. Hom. N. Y., 49. 678.

1894. *Cyrtolobus fenestratus* Goding. Cat. Memb. N. A., 431. 106.

1908. *Cyrtolobus muticus* (in part) Van Duzee. Stud. N. A. Memb., 83.

Common. A medium-sized brown species with a regularly rounded dorsum and a distinct "window" or semi-transparent spot in the center of the crest and a white band across the posterior process just before the apex. The tegmina are hyaline with clouded tips.

It has been collected most commonly on *Quercus velutina* but its life history is unknown.

Hosts: Black oak (*Q. velutina*), white oak, chestnut, red oak, scarlet oak.

New Haven, 21 June, 1904 (W. E. B.); Wallingford, 2 July, 1912 (D. J. C.); Litchfield, July (L. B. W.); Hamden, 20 June, 1920 (B. H. W.); Orange, 22 June, 1920 (M. P. Z.).

C. ovatus Van Duzee.

1908. *Cyrtolobus ovatus* Van Duzee. Stud. N. A. Memb., 82, pl. 2, fig. 14.

Rare. A southern form which apparently appears occasionally in the New England States.

Sordid yellow testaceous; dorsum regularly elliptical; head projecting slightly forward; posterior process high and carinate, exceeding apices of tegmina; tegmina hyaline, punctate at base.

Host and life history unknown.

Wallingford, 3 July, 1912 (D. J. C.).

C. fuliginosus (Emmons).

1854. *Cyrtosia fuliginosa* Emmons. N. Y. Agr. Rept., v, 154, pl. 13, fig. 15.

1893. *Cyrtolobus fuliginosus* Goding. Can. Ent., xxv, 172.

Probably common. Distinguished by its uniform dark brown color without markings. It is near the preceding species in appearance but is smaller and darker and has a lower crest. The head projects slightly forward and the posterior process just reaches the tips of the tegmina. The tegmina are strongly marked with brown with the apices lighter.

The life history has not been worked out, due largely to the fact that this species lives together with several others of the genus on white oak and the nymphs have not been distinguished from closely related forms.

Host: White oak.

Hamden, 11 July, 1915; New Haven, 16 June, 1915; Middlebury, 20 June, 1916 (M. P. Z.).

C. arcuatus (Emmons).

1854. *Cyrtosia arcuata* Emmons. Agr. N. Y., v, 154, pl. 13, fig. 14.

1894. *Cyrtolobus arcuatus* Goding. Cat. Memb. N. A., 433. 115.

1908. *Cyrtolobus muticus* (in part) Van Duzee. Stud. N. A. Memb., 83.

Rare. The species was described from New York but is more commonly found further south.

Yellowish, tinged with red; crest high and arising before the humeral angles; transverse band of pronotum often absent; pronotum long; head slightly projecting forward; eyes tinged with reddish; posterior process reaching tips of tegmina; tegmina entirely hyaline or faintly clouded with yellow.

Hosts and life history unknown.

No record from Connecticut.

C. tuberosus (Fairmaire).

1846. *Thelia tuberosus* Fairmaire. Rev. Memb., 307, No. 6.

1894. *Cyrtolobus tuberosus* Goding. Cat. Memb. N. A., 433.

Very common. The largest species of the genus and recognizable by the fact that it is twice as large as any of the other forms of *Cyrtolobus* in the State.

The crest is high and the translucent spot which characterizes the genus is very large. The insect is dark brown, mottled with darker brown, the dorsal crest is situated well back on the pronotum, the posterior process is very short, not reaching the tips of the tegmina, and the tegmina are smoky hyaline tipped with brown.

The entire life history is apparently spent on one host and the nymphal instars are recognizable but the place and method of oviposition has not been reported.

Hosts: White oak, red oak, hickory.

Litchfield, July (L. B. W.).

C. fuscipennis Van Duzee.

1908. *Cyrtolobus fuscipennis* Van Duzee. Stud. N. A. Memb., 91.

Fairly common. This species, also, was described from New York and although it has been very seldom reported since its original description, it is not uncommon.

It is large, with the pronotum low and the posterior process short. The tegmina are strongly colored with reddish brown and marked with darker.

The life history is not known.

Hosts: White oak, red oak, scarlet oak, beech.

Litchfield, July and Aug. (L. B. W.).

C. cinereus (Emmons).

1854. *Gargara cinereus* Emmons. N. Y. Agr. Rept., v, 156.

1893. *Cyrtolobus cinereum* Goding. Can. Ent., xxv, 172.

1894. *Azymna cinereum* Goding. Cat. Memb. N. A., 436.

1908. *Cyrtolobus cinereus* Van Duzee. Stud. N. A. Memb., 91.

Abundant on white oak. Near the preceding but smaller and with the tegmina almost entirely hyaline. The color is greenish

gray mottled with brown and banded with green. The pronotum is low and regularly arcuate, the metopidium convex, the posterior process short and sharp, and the tegmina wrinkled hyaline with the apices brown.

The life history is not known.

Hosts: White oak, red oak.

Litchfield, July and Aug. (L. B. W.); New Haven, 20 June, 4, 7 July, 1920 (B. H. W.); 18 June, 1920 (M. P. Z.); Orange, 22 June, 1920 (B. H. W.).

C. inermis (Emmons).

1854. *Gargara inermis* Emmons. Agr. N. Y., v, 167, pl. 13, fig. 9.

1894. *Atymna inermis* Goding. Cat. Memb. N. A., 436. 127.

1908. *Cyrtolobus inermis* Van Duzee. Stud. N. A. Memb., 90. 15.

Not common. An interesting little species of which the males are small and strikingly marked with black and white, and the females are larger and are uniformly greenish yellow.

The life history and hosts are not known.

New Haven, 9 June, 1914 (Q. S. L.).

C. vau (Say). (Pl. iv, 22.)

1831. *Membracis vau* Say. Jour. Acad. Nat. Sci. Phila., v, 299.

1851. *Thelia semifascia* Walker. List Hom. Brit. Mus., 561.

1851. *Smilia vau* Fitch. Cat. Ins. N. Y., 48.

1851. *Thelia vau* Walker. List Hom. Brit. Mus., 1141.

1886. *Cyrtosia vau* Provancher. Petite Faune Can., iii, 238.

1893. *Cyrtolobus nigra* Goding. Can. Ent., xxv, 172.

1893. *Cyrtolobus punctifrons* Goding. Can. Ent., xxv, 172.

1893. *Cyrtolobus trilineata* Goding. Can. Ent., xxv, 172.

1893. *Cyrtolobus vau* Goding. Can. Ent., xxv, 172.

1903. *Thelia fasciata* Buckton. Mon. Memb., 189.

1903. *Argante semifasciata* Buckton. Mon. Memb., 189. Pl. 40, fig. 9; pl. 41, figs. 1, 1a.

1909. *Cyrtolobus varius* Smith. Insects New Jersey, 92.

Very abundant. Probably the commonest species of *Cyrtolobus* in the State. The species shows, however, such a wide variation in size and coloration that it has been described under a number of synonyms and is often confused with other species in collections.

The typical form is small and very characteristically marked, with the compressed spot round and transparent, a pale brown transverse pronotal band bordered with deep brown, very conspicuous, and a prominent band of the same color before the apex, these two bands approaching near the lateral margin of the pronotum to form a "V" which doubtless suggested the specific name. The pronotum is low, closely and roughly punctate, the dorsal crest has only a faint sinus before the posterior process, the posterior process is short, blunt and tectiform, reaching only to the bases of the apical cells of the tegmina which are hyaline with the tips faintly clouded.

The life history has been worked out on white oak but the insect is found also on several other species of *Quercus*. The entire life history is usually passed on one host, the eggs being

laid in September, hatching about the middle of May, and the nymphal instars averaging respectively ten, six, five, ten and fourteen days in reaching maturity. Mating begins a few days after the last molt and oviposition begins during the same week.

Hosts: White oak, chestnut oak, red oak, scarlet oak.

New Haven, 15, 20 June, 1904; 20 June, 1905; 17 June, 1912 (W. E. B.); 6 July, 1904 (H. L. V.); 9, 18 June, 1914 (M. P. Z.); Wallingford, 25 June, 1912 (D. J. C.); Stonington, 16 June, 1914 (I. W. D.); Branford, 13 June, 1918 (B. H. W.); Lyme, 4 July, 1911 (H. B. K., A. B. C.); Hamden, 11 June, 1921 (B. H. W.); North Branford, 12 June, 1921 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.).

C. sculptus (Fairmaire).

1846. *Thelia sculpta* Fairmaire. Rev. Memb., 307. 5.

1867. *Cyrtosia sculpta* Stål. Ofv. Kongl. Vet-Akad. Forh., 24. 554.

1894. *Cyrtolobus sculptus* Goding. Cat. Memb. N. A., 432. 109.

Common on white oak. A small well-marked species distinguished by the prominent straight oblique stripe extending from the anterior margin of the dorsal crest where it is more or less dilated, to about the middle of the lateral margin of the pronotum. This stripe is white, bordered before by a narrow band of light brown and behind by a broader band of dark brown. The posterior process is heavy, blunt and tectiform and just reaches the apices of the tegmina which are smoky-hyaline.

The life history is not known. The species has been recorded from Connecticut only by Mr. L. B. Woodruff who reports that he has taken it on black oak, white oak and red oak, but chiefly on black oak.

Hosts: White oak, black oak, red oak.

Litchfield, 11 July, 1912 (L. B. W.).

C. intermedius (Emmons).

1854. *Cyrtosia intermedius* Emmons. N. Y. Agr. Rept., v. Pl. 13, fig. 16.

1894. *Cyrtolobus intermedius* Goding. Cat. Memb. N. A., 433.

Not common and hard to delimit. The color is chestnut-brown and if constant should be a good superficial character. The pronotum is low and gradually arcuate with shallow compressions. The posterior process is short and straight, not reaching the tips of the tegmina which are hyaline with the bases brown and punctate.

The life history is not known.

Hosts: White oak, red oak.

Litchfield, July (L. B. W.).

C. cinctus Van Duzee.

1908. *Cyrtolobus cinctus* Van Duzee. Stud. N. A. Memb., 86.

Rare. The females are large and greenish with a prominent curved pronotal stripe of dark brown; the males are smaller, very dark brown with obsolete markings. The tegmina of both sexes are hyaline with the bases greenish and punctate.

The life history is not known.

Host: White oak.

Litchfield, July (L. B. W.).

C. discoidalis (Emmons).

1854. *Gargara discoidalis* Emmons. N. Y. Agr. Rept., v, 157. Pl. 13, fig. 4.

1864. *Smilia carinata* Stål. Hem. Mex., 71.

1867. *Cyrtosia carinata* Stål. Ofv. Kongl. Vet-Akad. Forh., 24. 554.

1893. *Cyrtolobus discoidalis* Goding. Can. Ent., xxv, 172.

1894. *Atymna discoidalis* Goding. Cat. Memb. N. A., 436.

1896. *Atymna carinata* Fowler. Biol. Centr. Amer., 141.

Rare but easily distinguished by the prominent brown line on each side of the metopidium beginning just back of the humeral angles and continuing downward over the face. The general color is yellow marked with light brown. The posterior process is very short, not reaching the tips of the tegmina which are yellow hyaline with the tips tinged with light brown.

The life history is not known.

Host: Red oak.

Litchfield, July (L. B. W.).

C. maculifrontis (Emmons).

1854. *Gargara maculifrontis* Emmons. N. Y. Agr. Rept., v, 156.

1894. *Atymna maculifrontis* Goding. Cat. Memb. N. A., 436. 124.

1908. *Cyrtolobus maculifrontis* Van Duzee. Stud. N. A. Memb., 89. 13.

Should be common but has been reported only from Litchfield. Easily distinguished by the very prominent black spots on the metopidium which are often confluent to such an extent that the entire front of the prothorax is solid black. The general color is green or yellowish and the dorsum is regularly rounded.

The life history is not known.

Hosts: Swamp white oak (*Q. bicolor*), white oak.

Litchfield, June and July (L. B. W.).

Atymna Stål.

This genus and the next are usually considered as subgenera of the genus *Cyrtolobus*. The characters are entirely artificial and are dependent on the shape and structure of the pronotum which is somewhat variable and results in gradations of species from one group to another, making it extremely difficult to delimit the groups. These characters are, however, fully as well established as those which are used to set off other genera of the family, e.g., *Heliria*, *Glossonotus*, *Telonaca*, etc., and for purely taxonomic purposes it seems desirable to consider the groups as distinct genera in order to facilitate cataloging.

In *Atymna* those forms are included in which the pronotum is highest at its anterior extremity.

Three species are here recognized as follows:

Key to Species.

1. Crest distinctly highest at anterior extremity 2
 Crest highest just behind anterior extremity *helena*
2. Species small, 5-6 mm. 3
 Species large, 7-9 mm. *castaneae*
3. Pronotum punctate; female green, male black with broken yellow
 dorsal stripe *querci*
 Pronotum smooth; both sexes green *inornata*

A. castaneae (Fitch). (Pl. iv, 23.)

1851. *Smilia castaneae* Fitch. Cat. Ins. N. Y., 49.
 1851. *Thelia castaneae* Walker. List Hom. Brit. Mus., 1143.
 1854. *Gargara nigricephala* Emmons. N. Y. Agr. Rept., v. 157, pl. 13,
 fig. 5.
 1854. *Gargara viridis* Emmons. N. Y. Agr. Rept., v. 154, pl. 3, fig. 13.
 1867. *Atymna castaneae* Stål. Ofv. Kongl. Vet-Akad. Forh., xxiv. 554.
 1890. *Ophigemma nigrocephala* Smith. Ins. New Jer., 442.
 1894. *Ophiderma nigricephala* Goding. Cat. Memb. N. A., 440.
 1903. *Atymna lineata* Buckton. Mon. Memb., 194. Pl. 42, fig. 6.
 1908. *Cyrtolobus (Atymna) castaneae* Van Duzee. Stud. N. A. Memb.,
 93.

Abundant. A characteristic species on chestnut and found wherever this tree is common.

The forms vary remarkably in size and coloration. This peculiar variation does not seem to be sexual or seasonal and its cause is not known. Three forms are quite distinct—one large, immaculate green, another large, very dark brown, and a third small, light castaneous with very dark brown tegmina. Some differences have been noted between the nymphs that develop into these different forms, but not enough to warrant a taxonomic distinction. The variety that seems to be the most constant and most abundant is castaneous with a dark brown patch over each humeral angle and a brown line on the dorsal margin. The crest is highest at the front, gradually sloping to the apex of the posterior process which is short, not reaching the tips of the tegmina. The tegmina are deep castaneous with brown bases and tips.

It is not known whether or not the entire life history is passed on the chestnut as the complete series of instars has never been reported. The nymphs appear on this host in large numbers, however, about the middle of June and the adults about a month later. Both feed on petioles and blades of leaves. This species is one of the best fliers of all of our membracids and is commonly taken about lights. It is often taken on oaks in the vicinity of chestnuts and may spend part of its life on this host.

Hosts: Chestnut, red oak, white oak.

New Haven, 20 July, 1904; 21 June, 1909; 1 July, 1913 (B. H. W.); 13 July, 1904 (W. E. B., P. L. B.); 18 June, 1902 (E. J. S. M.); West Haven, 27 June, 1905 (H. L. V.); Westville, 18 June, 1904 (W. E. B.); Litchfield, June to Aug. (L. B. W.).

A. querci (Fitch).

1851. *Smilia querci* Fitch. Cat. Ins. N. Y., 49.
 1851. *Thelia querci* Walker. List Hom. Brit. Mus., 1143.

1854. *Gargara querci* Emmons. N. Y. Agr. Rept., v. 156, pl. 13, fig. 8.
 1890. *Atymna querci* Van Duzee. Psyche, v. 390.
 1908. *Cyrtolobus (Atymna) querci* Van Duzee. Stud. N. A. Memb., 93.
 1912. *Cyrtolobus querci* Matusch. Bull. Amer. Mus. Nat. Hist., 31.
 335.

Very common. Abundant on various species of oak and often taken on other hosts in the neighborhood of oaks, where, as the insects are strong fliers, their appearance may be accidental.

The species is distinct and well marked, the females being uniform green with the pronotum closely punctate, and the males brown with a light golden stripe down the median dorsal line, this stripe being broken near the posterior end of the pronotum so that the whole marking appears as a long dash followed by a dot. The insect is considerably smaller than the preceding species and the crest is highest above the humeral angles. In the females the tegmina are entirely hyaline; in the males they are smoky hyaline with brown at the apices.

The eggs and nymphs have been found only on oaks—chiefly white oak—which doubtless accounts for the specific name, and the life history is apparently passed on the one host.

Hosts: White oak, chestnut oak, red oak.

New Haven, 8 June, 1904 (W. E. B.); 14 June, 4 July, 1920 (B. H. W.); Litchfield, June (L. B. W.); Hamden, 5 July, 1920 (P. G.).

A. inornata (Say).

1831. *Membracis inornata* Say. Jour. Acad. Nat. Sci. Phila., v. 299.
 1851. *Smilia inornata* Fitch. Cat. Ins. N. Y., 48.
 1851. *Thelia inornata* Walker. List Hom. Brit. Mus., 1142.
 1882. *Atymna inornata* Lintner. List Rept. Ins. N. Y., 284.
 1886. *Ophiderma inornata* Provancher. Petite Faune Can., iii. 248.
 1908. *Cyrtolobus (Atymna) inornata* Van Duzee. Stud. N. A. Memb., 93.

Not common. The smallest species of the genus. Both sexes are green but the species may be recognized by the smooth polished surface of the pronotum, the punctures being very fine or obsolete.

It occurs on most species of oaks but its life history is not known.

Hosts: White oak, red oak, scarlet oak.

Litchfield, July to Sept. (L. B. W.).

A. helena Woodruff.

1915. *Cyrtologus* (printer's error) *helena* Woodruff. Journ. N. Y. Ent. Soc., vol. 23: No. 1, 44-47, pl. 4; figs. 1-6.
 1916. *C. (Atymna) helena* Van Duzee. Check List Hem., 61, 1691.

Three records from the State. May be more common than the records would indicate as the type locality is New York.

This species stands between the true *Cyrtolobus* and the true *Atymna* forms and we believe, and have suggested to Mr. Woodruff, that his assignment of the species to *Atymna* was questionable since the crest is highest over the posterior end of the humeral sinus. The color is greenish with an anterior transverse vitta,

and a dark cross band at the base and at the tip of the posterior process. The tegmina are strongly clouded with brown at the base.

The complete life history is not known but the dates of appearance, of copulation and of greatest abundance were noted in the original description.

Host: *Quercus bicolor*.

New Haven, 17 July, 1920 (B. H. W.); Orange, 22 June, 1920 (B. H. W.); Portland, 26 July, 1920 (B. H. W.).

Xantholobus Van Duzee.

Originally set off as a subgenus by Van Duzee to include those forms of the genus *Cyrtolobus* in which the posterior part of the pronotum is strongly inflated to produce a rounded swelling. Before this swelling the dorsum is constricted.

Key to Species.

Pronotum with three irregular oblique lines*muticus*

Pronotum with single yellow line at lateral margin*lateralis*

X. muticus (Fabricius).

1776. *Membracis mutica* Fabricius. Gen. Ins. Mant., 297. 12. 13.

1803. *Centrotus mutica* Fabricius. Syst. Rhyng., 21. 24.

1824. *Membracis trilineata* Say. Narr. Long's Exp., 300. 2.

1869. *Cyrtosia mutica* Stål. Hem. Fabr., ii. 25. 1.

1886. *Cyrtosia trilineata* Provancher. Petite Faune Can., iii. 239. 2.

1894. *Cyrtolobus muticus* Goding. Cat. Memb. N. A., 431. 105.

1904. *Cyrtolobus trilineatus* Wirtner. Ann. Carn. Mus., 3. 212.

1908. *Cyrtolobus (Xantholobus) trilineatus* Van Duzee. Stud. Memb., 96.

1913. *Xantholobus trilineatus* Funkhouser. Hom. Wing. Veins., figs. 45, 67.

1917. *Cyrtolobus muticus* Van Duzee. Cat. Hem., 549. 1695.

Very common. A large well-marked species easily recognized by the prominent swellings of the pronotum and the three irregular yellowish fasciae.

It is usually taken on red oak on which it shows the same general habits as the species of the genus *Cyrtolobus*. The life history has not been worked out but apparently it does not differ in any important respects from other members of the group except that it appears earlier in the Spring. Mr. Woodruff reports it as most common on white oak in the locality of Litchfield.

Hosts: Red oak, black oak, white oak.

New Haven, 9 June, 1914 (M. P. Z.); 7 June, 1909 (B. H. W.); Wallingford, 25 June, 1912 (D. J. C.); Killingly, 11 June, 1915 (W. E. B.); Lyme, 16 June, 1918 (B. H. W.); Litchfield, June and July (L. B. W.).

X. lateralis Van Duzee.

1908. *Cyrtolobus (Xantholobus) lateralis* Van Duzee. Studies N. A. Memb., 96.

Rare but at once recognized when found by the bright yellow band which bounds the lateral margin of the pronotum in both sexes. Nothing is known of its hosts, habits or life history.

Ophiderma Fairmaire.

A genus characterized by the rounded dorsum which shows no evidences of a ridge or crest. Most of the species are very hairy.

Key to Species.

- | | |
|---|---------------------|
| 1. Color brown, gray or brown-mottled | 2 |
| Color green or yellowish green | flava |
| 2. Pronotum with lateral stripe | 3 |
| Pronotum without lateral stripe | 4 |
| 3. Lateral stripe bright yellow, broad and straight | flavicephala |
| Lateral stripe gray or greenish, narrow and wavy | flaviguttula |
| 4. Size small, 5-6 mm. | 5 |
| Size large, 7-8 mm. | salamandra |
| 5. Brown with yellow markings | pubescens |
| Gray and white with black markings | grisea |

O. flava Goding.

1892. *Ophiderma flava* Goding. Insect Life, v. 93.

Probably rare. Occasionally taken by beating low shrubs and bushes but the particular host for oviposition is not known. Mr. Woodruff states in correspondence, that about Litchfield he has taken it usually on red oak.

The females are immaculate light green in color, fading to sordid yellow in cabinet specimens. The body is long and robust, the posterior process not reaching the apices of the tegmina which are hyaline with brown bases and fuscous-clouded tips. I have never seen an undoubted male of this species.

The life history is not known.

Hosts: Red oak, white oak, scarlet oak.

Westville, 2 June, 1906 (W. E. B.); New Haven, 14, 28 June, 1920 (B. H. W.).

O. flavicephala Goding.

1892. *Ophiderma flavicephala* Goding. Insect Life, v. 92.

Probably common in Connecticut and at once recognized by the broad yellow lateral band on or near the margin of the pronotum.

The pronotum is densely pubescent and punctate, broadly convex, and gradually sloping from the humeral region. The posterior process almost reaches the tips of the tegmina which are hyaline with the bases and tips brown.

The life history is not known and no specific host has been recorded.

New Haven, 18 June, 1918 (M. P. Z.); 28 May, 1921 (B. H. W.); Hamden, 30 May, 1921 (B. H. W.).

O. flaviguttula Goding.1894. *Ophiderma flaviguttula* Goding. Cat. Memb. N. A., 438. 132.1906. *Ophiderma flavoguttata* Slosson. Ent. News, 17. 326.

Very rare. May be recognized by the wavy gray or greenish line along the lateral border of the pronotum, the irregular yellow patch extending from the middle of the lateral margin of the pronotum upwards and forwards to the dorsum, and the yellowish head. The posterior process does not quite reach the apices of the tegmina which are hyaline in the center and brown at the bases and tips.

The life history is not known.

Hosts: Black oak (*Q. velutina*), red oak, white oak.

New Haven, 6 June, 1904 (W. E. B.); Litchfield, July (L. B. W.).

***O. flaviguttula** var. **definita** Woodruff.

Jour. N. Y. Ent. Soc., xxvii. 259.

Mr. Woodruff has described a new variety of this species which he has called *definita*. I have not seen this variety.

Litchfield (L. B. W.)?

O. salamandra Fairmaire.1846. *Ophiderma salamandra* Fairmaire. Revue Memb., 493. 1.

The largest and commonest species of *Ophiderma* in the State. This is a large brown species with the dorsum rounded and very pubescent with short black bristly hairs. The posterior process is short and suddenly acute, not reaching the apices of the tegmina. The tegmina are hyaline with the bases and costal areas strongly punctate and the tips clouded with fuscous. A noticeable character of the tegmina is the prominence of the veins. The general color is brown, mottled with green, the markings being very irregular.

The insect is very active and difficult to study in the field. The life history is not known.

Hosts: Red oak, white oak, scarlet oak, chestnut.

New Haven, 8 June, 1904; 14 July, 1909; 17 June, 1912 (B. H. W.); 9 June, 1914 (Q. S. L.); Middlebury, 20 June, 1916 (M. P. Z.); Goshen, 6 July, 1919 (M. P. Z.); Litchfield, July (L. B. W.).

O. pubescens (Emmons).1854. *Gargara pubescens* Emmons. N. Y. Agr. Rept., v, 157, pl. 13, fig. 2.1908. *Ophiderma pubescens* Van Duzee. Stud. N. A. Memb., 99.

Very abundant. A small hairy species common on most species of oaks throughout the Summer and apparently most abundant on *Quercus velutina*. The species is one of the smallest of the genus, light brown mottled with whitish or yellowish, dorsum convex, very pubescent, posterior process short and blunt not reaching tips of tegmina. The tegmina are hyaline with a median black stripe and brown clouded tips. The males are smaller and darker than the females.

The insects are active and are good fliers. Another of the interesting records for the State is the capture of this species on white pine at New Haven, June 9, 1913, by M. P. Zappe. It has already been mentioned that there are very few instances known of any membracid inhabiting an evergreen.

Hosts: Black oak (*Q. velutina*), scarlet oak, white pine.

New Haven, 1905 (A. E. Oman); 29 June, 1909 (B. H. W.); 9 June, 1913 (M. P. Z.); 10 June, 1915 (Q. S. L.); 17 June, 1912 (W. E. B.); Middlebury, 20 June, 1916 (M. P. Z.); Stonington, 20 June, 1914 (I. W. D.); Litchfield, July and Aug. (L. B. W.).

**O. grisea* Woodruff.

1920. *Ophiderma grisea* Woodruff. Jour. N. Y. Ent. Soc., xxvii. 254.

I have seen only one specimen of this species, a paratype, with which Mr. Woodruff has very kindly presented me.

It is an attractive little species with well-defined black and white markings on a gray ground color. It is near *O. salamandra* but is smaller and differently marked.

The host and locality records here given are taken from the above-mentioned specimen.

Host: *Quercus coccinea*.

Litchfield, 14 July, 1919 (L. B. W.).

Vanduzee Goding.

A genus close to *Ophiderma* but distinguished by the terminal cell of the tegmen which in *Vanduzee* is transverse and truncate at the base.

V. arquata (Say).

1831. *Membracis arquata* Say. Jour. Acad. Nat. Sci. Phila., v. 302.

1851. *Carynota arquata* Fitch. Cat. Ins. N. Y., 48.

1869. *Carynota arcuata* Rathvon. Momb. Hist. Lanc. Co. Pa., 551.

1878. *Carineta arquata* Glover. MS. Jour. Hom., pl. 2, fig. 24.

1890. *Ophiderma arquata* Van Duzee. Psyche, v. 389.

1892. *Vanduzee arquata* Goding. Insect Life, v. 92.

Should be the commonest membracid in the State but has only occasionally been reported and curiously enough in one instance the specimens were taken from giant ragweed where their appearance must have been accidental.

Extremely abundant throughout eastern United States on locust on which host it often appears in such numbers that several hundred individuals may be collected from one tree.

The insect is small, light chocolate-brown with deep brown and yellow-white markings in the female, and darker colors in the male, the dorsum regularly rounded, pubescent and punctate, the tegmina hyaline, clouded at base and near middle and extending beyond the tip of the posterior process which is sharp. The distinguishing character is the transverse terminal cell of the tegmen.

The life history has been worked out and described in detail (Psyche xxii: pp. 183-198. 1915) and is confined entirely to the one host. There should be three or four broods a year in Connecticut.

Host: Locust.

Litchfield, June (L. B. W.); New Haven, 4 July, 3 Oct., 1920 (B. H. W.); Wilton, 24 June, 1920 (M. P. Z.).

Entylia Germar.

A genus containing a large number of species, the standing of many of which is questionable. The distinguishing character of the genus is the high flattened dorsum with a deep median notch which separates it into two distinct crests.

E. bactriana Germar. (Pl. iv, 24.)

1835. *Entylia bactriana* Germar. Silb. Rev., iii, 248.

1851. *Entylia indecisa* Walker. List Hom. Brit. Mus., 549.

1851. *Entylia reducta* Walker. List Hom. Brit. Mus., 549.

1858. *Entylia impedita* Walker. List Hom. Brit. Mus., 137.

Very abundant. Van Duzee in his recent catalogue makes this species a synonym of *E. carinata* Foerster, and this is perhaps correct. However, while there is little doubt but that this common northeastern form is the one described by Germar as recognized by Fairmaire (Rev. Memb., 300. 4, pl. 5, fig. 32. 1846), by Stål (Bid Memb. Kans., 241. 1869), and by Van Duzee himself (Stud. N. A. Memb., 105. 1908), there is considerable doubt as to just what form Foerster had before him (Nova Spec. Ins., Cent. i, 67. 1781). It seems more conservative, therefore, to retain Germar's name at least until we are sure of the determination of *E. carinata*.

The species shows so much variation in color and shape that it is difficult to state which form is typical. Many differently appearing individuals may be reared from one egg-mass. It is usually found on various species of thistle on which the eggs are laid in a double row on the undersurface of the leaf. Oviposition begins about the first of July. The eggs hatch in about two weeks and the nymphs reach maturity in a little over three weeks, the instars averaging about five days each. The life history has been described (Biol. Memb. Cayuga Lake Basin, p. 290. 1917) as it develops on the thistle but the insect shows some slight difference in habits on other hosts. In some sections there are at least two broods a year. This is one of the species of Membracidae which winters over in the adult state occasionally in Connecticut.

Hosts: Thistle, joe-pye weed, sunflower, red-bud, forked panicum (*P. dichotomiflorum*), goldenrod.

New Canaan, 17 Sept., 1919 (B. H. W.); Litchfield, June to Sept. (L. B. W.); Cornwall, 30 May, 23 June, 1920 (K. F. C.); Huntington, 9 July, 1920 (P. G.).

Publilia Stål.

A genus near *Entylia* but showing a much less elevated crest and a much weaker median notch. Some of the forms are merely depressed in the center and the prothorax is only slightly compressed.

P. concava (Say).

1824. *Membracis concava* Say. Narr. Long's Exp., App. ii. 311.

1835. *Entylia concava* Germar. Silb. Rev., iii, 249.

1866. *Publilia concava* Stål. Analecta Hem., 388.

1869. *Ceresa concava* Rathvon. Momb. Hist. Lanc. Co. Pa., 551.

1894. *Publilia nigradorsum* Goding. Cat. Memb. N. A., 399.

1903. *Publilia vittata* Buckton. Mon. Memb., 185. Pl. 39, fig. 6.

Extremely abundant. A grass and shrub inhabiting species usually taken in sweeping. According to Mr. Woodruff, the common host about Litchfield is alder. In New York it seems to be most abundant on goldenrod.

The species may be distinguished from *Entylia bactriana*, the only other species in the State with which it is likely to be confused, by the slight dorsal depression and the general rounded shape of the pronotum. The color varies from gray to black and the pronotum is irregularly ridged and deeply punctate. The tegmina are largely covered by the pronotum.

Hosts: Goldenrod, skunk-cabbage, New England aster, wormwood, alder.

Branford, 28 June, 1905 (H. W. W.); Meriden, 3 June, 1910, Hamden, 14 June, 1911 (W. E. B.); North Branford, 8 June, 1912 (B. H. W.); Portland, 5 June, 1914, Middlebury, 31 May, 1916, Ansonia, 26 May, 1918 (M. P. Z.); Litchfield, May to July (L. B. W.).

Family CERCOPIDAE.*

BY LOUIS AGASSIZ STEARNS, M.Sc.

The insects known under variously applied descriptive names as cuckoo-spit, spittle insects, frog-hoppers and leaf-hoppers, together with the Cicadellidae (Jassoidea) and Fulgoridae, and belonging to the family Cercopidae, are of world-wide distribution. Although members are recorded for every Zoological Subregion, except the Hawaiian, the "headquarters" of this family is in Central and South America and in the Oriental Region and the Malayan portion of the Australian. Comparatively few representatives are known to occur in the Nearctic Region. This paper recognizes six genera (*Monecphora*, *Aphrophora*, *Lepyronia*, *Philaenus*, *Philaronia* and *Clastoptera*), comprising twenty-two species, as included within the Nearctic fauna. Two varieties (*infuscatus* and *pallidus*) of one species (*Philaronia bilineata* Say) are described herein as new.

* This paper, in substantially its present form, was submitted to fulfill the thesis requirement of a M.Sc. degree, at the Ohio State University, Columbus, Ohio, June, 1917.

The extreme variability and striking similarities in coloration shown by some species oftentimes renders exact identification difficult. Coupled with this fact, the literature with which to identify them is insufficient and at the same time inaccessible to the average student of Entomology. Papers by Dr. F. W. Goding (1892), Dr. E. D. Ball (1895 and 1898), and Prof. Z. P. Metcalf (1917) include the more recent and important work that has been completed with this interesting group of insects. The comprehensive studies of the family by Dr. Ball are quite adequate, but unfortunately they occur in isolated volumes of the Proceedings of the Iowa Academy of Science which are not usually at the disposal of the student.

It was the original intention of the writer to cover the family Cercopidae for New England localities only, since he had had the opportunity to collect a large series of specimens in that section of the country. But from this preceding, brief summary concerning the work on the group during comparatively recent years, it is evident that another systematic paper, containing a descriptive key with accompanying explanatory figures, together with as extensive distribution records as possible, would be of unquestionable value at the present time, and it is hoped that it will be of assistance to students in systematic work.

The family Cercopidae has been variously ranked in different classificatory systems. Without a doubt, however, its exact position among the most specialized of the Auchenorrhynchous Homoptera was expressed, when Professor Herbert Osborn (1895) stated that "the Cercopidae in the development of the scutellum, the texture of the elytra, and the specialization of the tibiae show characters of high rank, and if placed subordinate to the Jassoidea (Cicadellidae) must be considered a branch of nearly equal or parallel rank."

The name of "cuckoo-spit" applied to these forms in Europe dates from classic times when it was believed that the insects were born from the saliva of cuckoos. The production of froth, a common occurrence in Homopterous families, is particularly noticeable in this family. This frothy matter or "spittle" is formed by liberating air beneath a liquid film excreted from the anal opening, of the sap imbibed by the insects in large quantities. In reality, it is a protective device for the nymphal forms.

Economically, the "Cercopids," together with other closely allied Homopterous families, are of considerable importance. Usually these forms do not occur in sufficient numbers to become noticeably destructive, but in some instances their depredations are extensive. Generally speaking, their food plants are the pine, alder, blueberry, cranberry, dogwood and different species of grasses. "It is not alone the exhaustion consequent upon the rapid draining of the

plants' juices by the almost microscopic mouth-setae that is so deleterious; it is the addition of the horde of fungus spores which often subsequently attack the wounded surface and quickly multiplying penetrate into the tissues of the plant causing decay and death." The foregoing quotation from a paper (1906) by Mr. G. W. Kirkaldy forcibly emphasizes the extremes attendant to the immediate damage caused by these insects. Professor Herbert Osborn has so adequately covered the economic importance of this family in a recently published (1916) bulletin of the Maine Agricultural Experiment Station that a more detailed consideration of this phase of the subject is unnecessary here.

During the prosecution of this work I have employed a large series of specimens personally collected in New England, Tennessee and Ohio. I am under special obligations to several who have assisted me:—to Mr. C. W. Johnson (Curator, Boston Soc. Nat. His.), Dr. E. P. Felt (N. Y. State Entomologist) and Professors H. T. Fernald (Mass. Agri. College) and W. C. O'Kane (N. H. State College) for distribution records from their respective localities, and to Mr. D. M. DeLong (Pa. Bureau Plant Industry) and Professors Z. P. Metcalf (A. M. College, N. C.), J. G. Sanders (Pa. Bureau Plant Industry) and C. P. Gillette (Colo. Agri. College) for exchange and loan of material and distribution records. Especially do I wish to express my indebtedness and appreciation to Professor Herbert Osborn (Ohio State University) for the use of his private collection containing type specimens and extensive distribution records, and for generous suggestions and continual kindly encouragement.

This family is readily distinguished from the closely allied Homopterous groups, Cicadellidae (Jassoidea) and Fulgoridae, by the structure and arrangement of the spines on the hind tibiae. Here, the cylindrical hind tibiae are armed with two spurs on the outer margin, and, together with the first two joints of the tarsi, terminated with a crescentic row of spines, the third having a bifid claw. In the Cicadellidae, two distinct rows of spines extend the length of the tibiae, and, while some Fulgoridae have similar spurs, the angulate tibiae and the insertion of the antennae below instead of between the eyes insure identification.

Family characters: Body stout, compact; general form oval or elongate; frons usually tumid and convex or compresso-produced, transversely ribbed, dorsally somewhat flattened forming a subquadrate insertion (the tylus) in the anterior margin of the vertex from which it is separated by a distinct suture; vertex sloping, anterior margin rounding or angulate; ocelli two, situated in vertex before base; antennae short, inserted between eyes and beneath margin of vertex, two basal joints bead-like, the remainder setaceous; pronotum large, sexangular to trapezoidal, anterior

margin straight or angularly rounded; scutellum small, triangular; elytra longer than abdomen, frequently coriaceous, pubescence variable; distinctive hind tibial characters as mentioned above.

*Key to Subfamilies.**

- Anterior margin of pronotum straight; eyes equally long and broad CERCOPINAE, p. 209
 Anterior margin of pronotum rounded or angular; eyes frequently transverse APHROPHINAE, p. 211

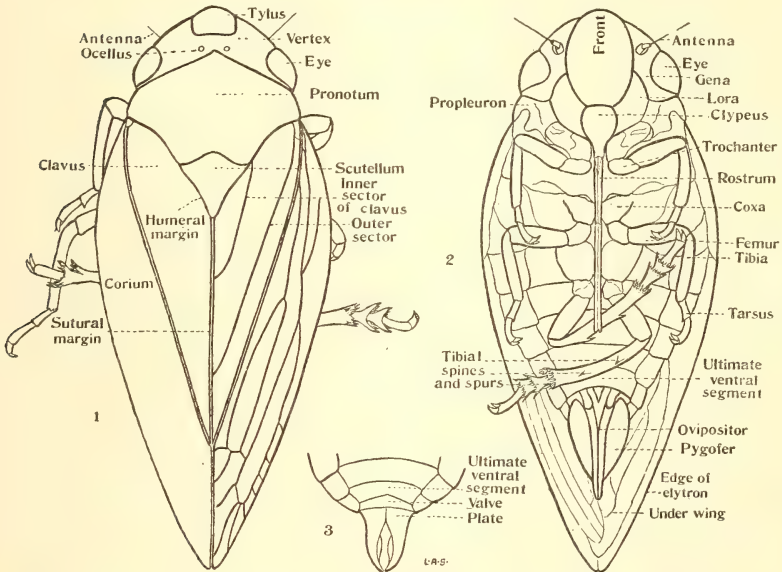


FIG. 18. A Cercopid, showing structures. (1) dorsal view, (2) ventral view of female, (3) male genitalia. All greatly enlarged. Drawing by L. A. Stearns.

Subfamily CERCOPINAE.

The members of this subfamily are large, broadly oval, brilliantly colored, mostly tropical forms; but a single genus and a single species occurring within the Nearctic fauna.

Monecphora Amyot and Serville.

Head small, much narrower than humeral angles of pronotum; front strongly inflated, anteriorly produced, rounding back to vertex, usually medially unicarinate; rostrum short, two-jointed,

* Adapted from Stål.

not exceeding middle coxae; vertex much shorter than pronotum, obtusely angulate; ocelli close together; pronotum, lateral margins long, strongly oblique, posterior margin straight or emarginate; elytra coriaceous, much wider than pronotum, lateral margins rounding symmetrically to apex, venation somewhat obscure, apically reticulate.

M. bicincta (Say). (Fig. 19, 1-4.)

Cercopis bicincta Say. Jour. Acad. Nat. Sci. Phila., vi, 303, 1831.

Moncephora bifascia Walker. List Hom. Brit. Mus., 679, 1851.

Moncephora angusta Walker. List Hom. Brit. Mus., 680, 1851.

Moncephora neglecta Walker. List Hom. Brit. Mus., 683, 1851.

Moncephora ignipecta Fitch. (Descrip.) Third Rep. Ins. N. Y., 71, 1856.

Tomaspis rubra Fowler. Biol. Cent. Amer., 183 (in part), 1897.

Tomaspis bicincta Ball. Proc. Ia. Acad. Sci., vi, 207, 1898.

Robust, broadly oval, with narrow angulate head. Black, conspicuously marked with red and yellow. Length 8-10 mm.; width 5 mm.*

Vertex broad, disc sloping, deep depressions lateral to median carina continuing along suture of vertex and tylus; front strongly inflated, nearly right-angled with vertex, medially unicarinate; pronotum, disc convex, one-half wider than long, lateral margins roundly divergent, reflexed, posterior margin roundly emarginate; elytra convex, about twice longer than wide, apex broadly rounded; pubescence fine, sparse.

Genitalia: Female, last ventral segment one-half as long as preceding, flattened in median line, laterally depressed; plates in median line at base of ovipositor curved outwardly, converging to sharply pointed apices; pygofers broad, outer margin incurved, exceeded one-third their length by ovipositor. Male, valve short, truncate, on apical border scarcely wider than base of plates; plates long, length twice width, pointed, outer margins sinuate, inner margins strongly incurved from anterior third to tip. Both male and female structures *in toto* projected dorsally in vertical plane.

Color: Dark chestnut-brown to black; entire margin and longitudinal median carina of vertex, eyes and ocelli, and lateral margins of pronotum, red; a narrow transverse band across the humeral angles of pronotum and two slightly wider ones parallel to this trisecting the elytra, red varying to creamy-yellow (typical form *bicincta*); dark form with bands partly or entirely absent (var. *ignipecta* Fitch).

Distribution: This single species of the genus *Moncephora* (a genus well represented in the tropics), while a common species in collections from Mexico and the West Indies, has but a sparse distribution in the United States. Its varietal distribution is quite conspicuous. The var. *ignipecta* Fitch (Pl. iv, 26) is a northern form exclusively, has a distribution throughout the New England

* Width is given as greatest measurement across elytra when folded.

States (not recorded for Maine). In New York this variety grades into, and southward on the Atlantic slope gives way to, the typical form *bicincta*, which form occurs "throughout the gulf states and up the Mississippi valley as far as Central Iowa, where it is extremely rare." (Ball.)

Stafford, 24 Aug., 1905 (W. E. B.); Manchester, 11 Aug., 1916; Hamden, 15 Aug., 1916 (M. P. Z.); New Haven, 1 Aug., 1920 (B. H. W.); Danbury, 29 Aug., 1920 (B. H. W.); Yalesville, 20 Aug., 1920 (M. P. Z.); Portland, 25 July, 1920 (B. H. W.).

Subfamily APHIROPHORINAE.

The members of this subfamily are smaller, more elongate, rather somber colored forms; five genera comprising twenty-one species occurring within the Nearctic fauna.

Key to Genera.

1. Apex of clavus acute, corium without a terminal membrane; form large, elongate 2
 Apex of clavus broadly rounded, corium with a broad terminal membrane; form small, globose *Clastoptera*, p. 230
2. Form usually smaller; anterior margin of pronotum rounded; vertex and pronotum without a pronounced median carina; rostrum short and stout, two-jointed, reaching the middle coxae; ocelli nearly equidistant from eyes and each other 3
 Form usually larger, more elongate; anterior margin of pronotum angulate; vertex and pronotum with a pronounced median carina; rostrum long, three-jointed, the last and longest segment exceeding the hind coxae, ocelli nearer to each other than eyes
Aphrophora, p. 211
3. Anterior margin of vertex between eyes and front sulcate; pubescence of dorsal surface variable 4
 Anterior margin of vertex between eyes and front non-sulcate; pubescence of dorsal surface dense obscuring venation
Lepyronia, p. 220
4. Elytra with about five apical cells; pubescence of dorsal surface sparse *Philaenus*, p. 224
 Elytra irregularly reticulated apically; pubescence of dorsal surface dense *Philaronia*, p. 228

Aphrophora Germar.

Vertex, disc weakly convex or flattened, sloping, medially carinate, anterior margin obtuse or rectangulate, apex rounding; tylus broad, weakly carinate; ocelli located close to posterior margin of vertex, nearer each other than to eyes; front, disc convex, transversely rib-punctured, except on median line, inflated, acutely angulate with vertex; rostrum long, three-jointed, the last and longest segment exceeding the hind coxae; pronotum large, disc convex, sloping, medially carinate, anterior margin broadly, obtusely angulate, medially produced into a triangular notch on posterior margin of vertex between ocelli, lateral margins short, length about equal to distance between ocelli, posterior

margin broadly, roundly emarginate; scutellum centrally depressed; elytra coriaceous, convex, about twice longer than wide, costal margins expanded, apex roundly angulate; wings with the third vein from the marginal vein forked and forming a closed apical cell; entire dorsal surface coarsely, irregularly punctate; male valve wanting.

The members of this genus resemble each other so closely in their moderate size (7-12 mm.) and uniform grayish-brown coloration that it is possible to separate them accurately only by reference to specific structural characters. The convexity of the pronotum, the degree of inflation of the front with the corresponding variation of the facial angle, and in male specimens, the shape of the male plates prove, usually, reliable characters for specific determinations.

Key to Species.

1. Pronotum flattened-convex; front slightly inflated; color grayish brown, two variably distinct hyaline areas on elytral margins; elytra usually broadly convex, with costal margins more strongly expanded 2
 Pronotum strongly convex, elevated posteriorly; front strongly inflated; color varying brown, hyaline areas absent, elytra obliquely banded; elytra elongate convex, with costal margins narrowly expanded 3
2. Size small, not exceeding 8 mm.; narrower; dark grayish brown, hyaline areas distinct *quadrinotata*
 Size large, 10 mm. or more; broader; pale grayish brown, hyaline areas indistinct *angulata*
3. Usually larger; elytra more strongly convex, with costal margins more broadly expanded; color varying deep brown; front inflated and produced, nearly right-angled with vertex 4
 Usually smaller; elytra narrowly convex, with costal margins slightly expanded; color varying light brown; front scarcely inflated, flattened convex, acutely angled with vertex 6
4. Head broad, short; vertex rounding, obtusely angulate before; apex of elytra sharply, acutely angulate 5
 Head narrow, elongate; vertex almost rectangulate before; apex of elytra bluntly, acutely angulate *parallela*
5. Larger; union of front and vertex a large acute angle; color dark brown, mottled with lighter *irrorata*
 Smaller; union of front and vertex approximating a right angle; color light brown, elytra more or less distinctly, obliquely banded *permutata*
6. Color varying ochraceous, light stripe and light elytral bands obscure or wanting; front slightly inflated, angle with vertex less acute 7
 Color deep fulvous, a distinct median stripe from anterior margin of tylus broadening across vertex and pronotum to basal angles of scutellum, and elytra distinctly banded with light; front usually not at all inflated, angle with vertex more acute *saratogensis*
7. Color light ochraceous, whole surface irregularly but heavily mottled and elytra obliquely banded with chestnut *annulata*
 Color tawny brown to pale ochraceous, indistinct median stripe from anterior margin of tylus broadening across vertex and pronotum to basal angles of scutellum, and elytra indistinctly, obliquely banded with light *signoretii*

A. quadrinotata Say. (Fig. 19, 5-8.)

Aphrophora quadrinotata Say. Jour. Acad. Nat. Sci. Phila., vii, 304, 1831.

Aphrophora fascialis Walker. Ins. Saund., Hom., 93, 1858.

This species is distinguished readily from others of the same genus by its smaller size, dark grayish-brown color, and the presence of two large distinct hyaline areas on the costal margins of the elytra. Length 7-8 mm.; width 3-3.5 mm.

Vertex, length on middle one-third greater than at eye, medially elevated, moderately, sharply carinate, entire anterior margin broadly rounding, reflexed to form slightly depressed areas between margins and median elevation; tylus, length one-half width, sharply carinate; front scarcely inflated, distinctly acute-angled with vertex; pronotum, length one-half width, disc roughened, median carina weakening posteriorly, lateral margins parallel, sharply carinate; elytra moderately broad, costal margin flaring before middle; punctures setigerous.

Genitalia: Female, last ventral segment strongly convex, length less than that of preceding; pygofer, length one-third greater than width, outer margins roundly, obliquely angulate at end of basal third and deeply, abruptly incurved at apical third, exceeded by ovipositor slightly less than one-third their length. Male, last two ventral segments abruptly narrowing, elongate, strongly convex; plates small, length one-half their basal width, separated at base by their own width, inner margins parallel, outer margins rounding to acutely angulate apex.

Color: Constant, dark grayish-brown; vertex and anterior half of pronotum lighter; costal margins at base, oblique band from scutellum broadening to beyond middle on costa, marginal spot at apex and apical reticulations accentuated in deep brown; variable areas, triangular on middle of costal margin and elongate on margin before apex hyaline,

Distribution: Specimens have been examined from the New England States, New York, New Jersey, Maryland, Virginia, District of Columbia, Tennessee, Ohio, Ontario (Can.), Wisconsin, Minnesota, Iowa, and Kansas. It has been reported from Georgia, Florida, and Nebraska (Ball); and from North Carolina (Metcalf).

Scotland, 27 July, 1904, Hamden, 24 July, 1910 (B. H. W.); Darien, 8 April; New Haven, 6 Aug., 1917 (W. E. B.); Milford, 2 Aug., 1917 (M. P. Z.); Branford, 12 Aug., 1904 (P. L. B.); Guilford, 13 July, 1920 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.).

A. angulata Ball. (Fig. 19, 9-12.)

Proc. Ia. Acad. Sci., vi, 212, 1898.

Resembling *quadrinotata* in its pale grayish brown color and two indistinct hyaline areas on the costal margins of the elytra, but distinctly larger and more obscurely marked. Length 10-12 mm.; width 4-4.5 mm.

Vertex, length on middle one-third greater than at eye, equal to one-third width across eyes, and equal to one-half length of pronotum behind it, medially elevated, moderately sharply carinate, roughened and depressed before reflexed lateral margins; tylus, length one-half width, weakly sharply carinate, anterior margin rounded, produced; front weakly inflated, distinctly acute-angled with vertex; pronotum, length two-thirds width, anterior third of disc depressed, roughened, carina strong across depression, weakening posteriorly, lateral margins divergent, sharply carinate; elytra long, broadly convex, costal margins flaring widely before middle, thence rounding to angulate apex.

Genitalia: Female, last ventral segment one-half as long as preceding, weakly convex; pygofers, length one-third greater than width, outer margins broadly curved at base, narrowing apically, exceeded by ovipositor one-fourth their length. Male, last two ventral segments narrowing, convex; plates fused, length slightly greater than width, disc laterally tooth-notched before apical third, apex broadly truncate, medially notched, either side of which slightly emarginate to roundly produced lateral angles.

Color: Constant pale grayish-brown; vertex and anterior half of pronotum lighter; approximating pale ochraceous; distinct spot on costa at middle broadening and usually fading inwardly on disc, obscure spot on costal margin at base and another obscure marginal spot at apex, deeper brown; variable obscure areas, triangular before middle of costal margin and elongate on margin before apex, hyaline.

Distribution: Pacific Coast (Van Duzee).

This species was described, as stated by Dr. E. D. Ball (1898), "from a single female labeled 'Cal.' received from Professor Bruner" and after the examination of other specimens "one of which bore Uhler's Mss. name, *A. angulata*." I have examined a series of fifteen male and fifteen female specimens collected by Professor Hine, Ohio State University, Department of Entomology, during July, 1907, from the following California localities: "San Antonia Canyon, Ontario," "Sta. Cruz Mts.," and "Alameda Co." Both the male and female specimens agree structurally and in coloration with Dr. Ball's description and I have, here, described and figured the male genitalia for the first time.

A. parallela (Say). Pine spittle bug. (Pl. iv, 37; Froth mass, Pl. xx, 6.) (Fig. 19, 13-16.)

Cercopis parallela Say. Narr. Long's Exped., ii, 304, 1824.

Ptyelus cribratus Walker. List Hom. Brit. Mus., 712-20, 1851.

Large, broadly convex, with narrow, elongate head and the front strongly inflated; color dusky reddish-brown, the elytra narrowly, obliquely, and sometimes obscurely, banded with light. Length 8-12 mm.; width 3.5-5 mm.

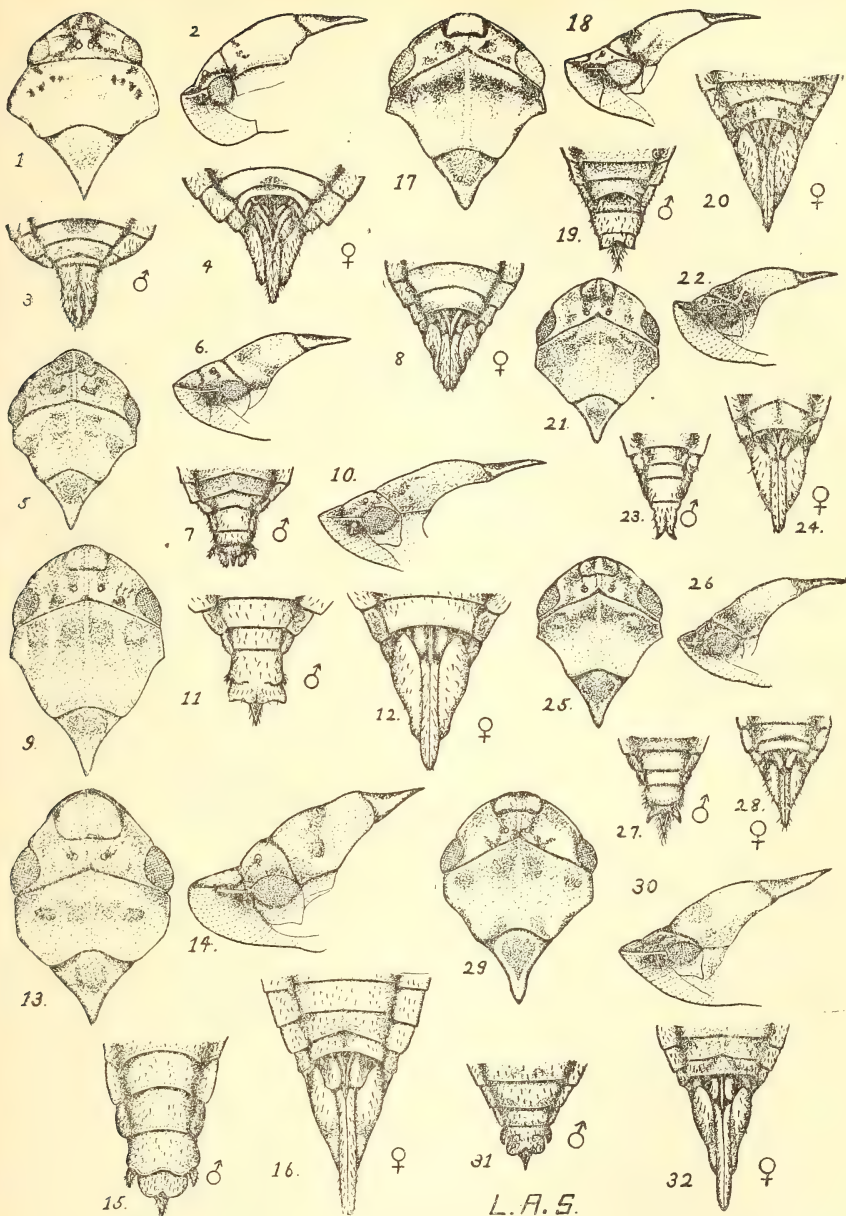


FIG. 19. (1-4) *Monecphora bicincta* Say,—(1) head, dorsal view, (2) head, lateral view, (3) male genitalia, (4) female genitalia. (5-8) *Aphrophora quadrinotata* Say,—(5) head, dorsal view, (6) head, lateral view, (7) male genitalia, (8) female genitalia. (9-12) *Aphrophora angulata* Ball,—(9) head, dorsal view, (10) head, lateral view, (11) male genitalia, (12) female genitalia. (13-16) *Aphrophora parallela* Say,—(13) head, dorsal view, (14) head, lateral view, (15) male genitalia, (16) female genitalia. (17-20) *Aphrophora irrorata* Ball,—(17) head, dorsal view, (18) head, lateral view, (19) male genitalia, (20) female genitalia. (21-24) *Aphrophora permutata* Uhler,—(21) head, dorsal view, (22) head, lateral view, (23) male genitalia, (24) female genitalia. (25-28) *Aphrophora annulata* Ball,—(25) head, dorsal view, (26) head, lateral view, (27) male genitalia, (28) female genitalia. (29-32) *Aphrophora saratogensis* Fitch,—(29) head, dorsal view, (30) head, lateral view, (31) male genitalia, (32) female genitalia. All greatly enlarged. Drawing by L. A. Stearns.

Vertex long, length on middle one-half that across eyes, disc strongly sloping from posterior margin to tylus, median carina weak, anterior margin scarcely curved to tylus; tylus, disc elevated, flattened, produced, almost rectangulate before, length two-thirds width; ocelli equidistant from posterior margin of vertex and from tylus; front, disc broadly, strongly convex, much inflated and produced, extending slightly beyond and rounding back to vertex; pronotum, disc transversely roughened in median line by a series of irregular depressions, median carina weak, lateral margins long, length equal to distance between ocelli and eyes; elytra broadly convex, costal area very broad, apex bluntly, acutely angulate.

Genitalia: Female pygofer long and narrow, length one-third greater than width, outer margins tapering, exceeded by stout ovipositor one-third their length. Male, last ventral segment strongly convex, length equal to basal width, narrowing apically, posterior margin sinuate with lateral angles produced style-like as long as the plates; plates subquadrate, fused, apex medially notched, lateral angles rounded.

Color: Varying tawny, punctured with dark brown; anterior margin of vertex to tylus and median carina bordered with darker; median carina from anterior margin of tylus across vertex and pronotum, and angles of scutellum broadly white; an interrupted, sometimes obscure, oblique band from apex of scutellum meeting at center on costa a similar band from the sutural apex of the clavus, grayish-brown; apical reticulations accentuated in deep brown.

Distribution: Specimens have been examined from the New England States, New York, New Jersey, Ohio, Michigan, Ontario (Can.), Wisconsin, and Minnesota. It has been reported from Pennsylvania, Maryland, and West Virginia (Ball).

Stonington, July, 1909 (G. H. H.); Orange, 30 June, 1911 (S. N. Spring); Portland, 10 Aug., 1913, Rainbow, 30 June, 1914 (B. H. W.); Thompson, 31 July, 1914 (I. W. D.); New Haven, 26 June, 1915 (M. P. Z.); Brookfield, 27 June, ?(E. L. D.).

A. irrorata Ball.* (Fig. 19, 17-20.)

Aphrophora irrorata Ball. Proc. Ia. Acad. Sci., vi, 214, 1898.

Large; color varying light tawny to dark rusty-brown, flecked with lighter; closely resembling *parallela* in size and coloration but with a much broader, shorter, more angulate vertex and a less strongly inflated front. Length 11-12 mm.; width 3.5-4.5 mm.

Vertex short, length on middle but slightly greater than at eye, disc flattened-depressed between weak median carina and broadly rounded anterior margin; tylus short, length equal to one-half width and equal to length of vertex behind it, but slightly pro-

* Described from type specimens; male, "Squaw Canon, Sioux Co., Neb. 7-22-92," female, "War Bonnet Canon, Sioux Co., Neb. 6-22-90."

duced, disc elevated, flattened, median carina obscure; front, disc strongly convex, inflation moderate, less than in *parallela*; pronotum, disc transversely, strongly depressed before middle, posteriorly elevated, carina weak except across depressed area, lateral margins short, distinctly divergent, posterior margin narrowly emarginate; elytra long and narrow, strongly convex, costal margins slightly expanded, apex sharply acutely angulate.

Genitalia: Female pygofers short and convex, length but slightly greater than width, outer margins rounded to middle, thence narrowing to apex, exceeded by ovipositor one-third their length. Male, last ventral segment strongly convex, length less than basal width, narrowing apically, posterior margin laterally tooth-notched; plates broad, fused, parallel-margined, apex medially excavated, leaving a rounded notch nearly half their depth, either side of which slightly diverging to acutely produced lateral angles.

Color: Varying light tawny to dark rusty-brown; spot either side of tylus, median carina on tylus and vertex, anterior half of pronotum, and angles of scutellum, light; elytra deep tawny, flecked with lighter, sometimes forming obscure, oblique bands along suture on disc, and usually showing three light areas, separated by two darker ones along the costa.

Distribution: Specimens have been examined from Colorado and Nebraska.

A. permutata Uhler. (Fig. 19, 21-24.)

Aphrophora permutata Uhler. List Hem. Colo. and N. Mex., 472, 1872 (Mss.).

Aphrophora permutata Uhler. List Hem. West Miss. River, Bull. U. S. Geol. Surv. Terr., v, 345, 1876 (Descrip.).

Color varying tawny, elytra obliquely banded with dark brown; resembling *irrorata*, but with a more inflated front, the vertex more narrowly rounded before, and form in general narrower and more sharply angulate behind. Length 9-12 mm.; width 3.5 mm.

Vertex short, length on middle one-fourth greater than at eye, disc transversely depressed along suture with tylus, median carina weak, anterior margin narrowly rounded to tylus; tylus short, length equal to one-half width, slightly produced and rounded before, disc elevated laterally and anteriorly, median carina obscure; front broad, disc strongly convex, moderately inflated and produced anteriorly, forming an elevated right angle with vertex; pronotum, disc transversely depressed in anterior third, the depression broken by sharp longitudinal ridges midway between median line and lateral margins, posteriorly elevated, carina weak except across depressed area, lateral margins short, slightly divergent; scutellum deeply centrally depressed; elytral margins narrowly expanded on costa, apex sharply, acutely angulate.

Genitalia: Female, last ventral segment broadly convex; pygofers and ovipositor stout and compact, coarsely pubescent;

pygofers, length one-third greater than width, outer margins rounded, exceeded by ovipositor one-fourth their length. Male, last ventral segment weakly convex, length slightly less than basal width, narrowing apically; plates long, tapering processes, length one-half greater than basal width, outer margins sinuate, inner margins fused in basal third, thence attinent until just before black tips, where they narrow slightly and diverge.

Color: Varying tawny, punctured with darker; spot either side of tylus, median carina throughout entire extent, anterior half of pronotum, and angles of scutellum, lighter; an oblique, broad band from scutellum to costal margin, another shorter and more obscure behind it, and a marginal spot at base of costa, dark brown variably margined with whitish.

Distribution: Specimens have been examined from Washington, Oregon, Colorado, and Montana. It has been reported from Vancouver's Island and Idaho (Ball), and from Utah (Uhler).

A. saratogensis (Fitch). (Pl. iv, 28.) (Fig. 19, 29-32.)

Lepyronia saratogensis Fitch. Cat. Hom. N. Y., 53, 1851.

Ptyelus detritus Walker. List Hom. Brit. Mus., 713, 1851.

Ptyelus gelidus Walker. List Hom. Brit. Mus., 714, 1851.

Color deep fulvous, a broadening median stripe from anterior margin of tylus to base of scutellum, and elytra obliquely banded with light; form narrow and elongate, front scarcely inflated, apex of elytra acutely angulate. Length 8.5-11 mm.; width 3-4 mm.

Vertex, length on middle one-third greater than at eye, disc elevated in median line, bluntly carinate, anterior margin from eyes to tylus nearly straight; tylus, length one-third width, disc flattened; front small, scarcely inflated, angle with vertex very acute; pronotum, disc weakly convex, transverse depressions before middle slight, carina weak except across depressed area, where it appears as a blunt elevation, lateral margins parallel; elytra long and narrow, costal margins scarcely reflexed, apex sharply, acutely angulate.

Genitalia: Female pygofers long, length one-half greater than width, exceeded by stout ovipositor almost one-half their length. Male, last ventral segment very short, convex, laterally tooth-notched on posterior margin; plates subquadrate, fused, medially notched to one-third their depth at apex, outer margins produced, broadly rounded behind.

Color: Varying fulvous to grayish-brown; vertex and pronotum darker, with a broadening median light stripe from anterior margin of tylus to base of scutellum; elytra lighter, usually with distinct light bands running obliquely from the scutellum to costal margins, in obscurely marked specimens the banded area of the disc appearing mottled with light gray.

Distribution: Specimens have been examined from the New England States, New York, Maryland, District of Columbia.

Wisconsin, and South Carolina. It has been reported from North Carolina (Metcalf), and from Ontario (Can.), and West Virginia (Ball), while Walker's species were from Nova Scotia and Florida.

Poquonock, 27 June, 1905 (H. L. V.); New Haven, 14 July, 1910 (B. H. W.); Cornwall, 18 July, 1921 (B. H. W.); Portland, 25 July, 1920 (B. H. W.).

A. annulata Ball.* (Fig. 19, 25-28.)

Aphrophora annulata Ball. Proc. Ia. Acad. Sci., vi, 216, 1898.

Color ochraceous, the elytra obliquely banded with deep chestnut; resembling *saratogensis*, from which it should be distinguished readily, however, by its lighter coloring, more heavily marked elytra, the absence of the light median stripe on the vertex and pronotum, and by the greater inflation of the front. Length 10-11 mm.; width 3.5-4 mm.

Vertex, length on middle scarcely greater than at eye, disc slightly depressed between the median bluntly carinate elevation and the straight anterior margin between the eyes and tylus; tylus, length equal to one-half width and equal to length of vertex behind it, slightly produced and rounded before; front, disc strongly convex, moderately inflated and slightly produced, forming a large acute angle with vertex; pronotum, disc transversely, strongly depressed in anterior third, posteriorly elevated and broadly rounded, carina weak, lateral margins slightly divergent, posterior margin narrowly emarginate; scutellum deeply, centrally depressed; elytra with costal margins reflexed anteriorly, the apex rounding, acutely angulate.

Genitalia: Female pygofers convex, scarcely longer than wide, outer margins diverging to middle, then abruptly cut off to form a rounded obtuse angle, exceeded by narrow ovipositor one-third their length, clothed with a coarse, golden pubescence. Male, last ventral segment convex, length one-half basal width, narrowing apically; plates broad at base, outer margins flaring, inner margin cut off obliquely nearly to base, leaving two widely divergent, black-tipped processes.

Color: Ochraceous; median carina on vertex bordered with chestnut; pronotum pale, a broadening oblique stripe, sometimes obscure, from just before middle on either side of carina to basal angles of scutellum, deep chestnut; margins of scutellum pale; elytra with an oblique band from scutellum broadening to middle on costal margins, and another before claval apex, deep chestnut.

Distribution: Specimens have been examined from New Hampshire, North Carolina, Colorado, Utah, and California.

A. signoretii Fitch.

Third Rep. Ins. N. Y., 70, 1856.

Color tawny-brown varying to pale ochraceous, simulating

* Described from type male specimen "Wasatch, Utah, 6-27-91."

saratogensis in an indistinct median light stripe across vertex and pronotum and obscure oblique light bands on the elytra; general form slightly smaller, the vertex shorter, more broadly rounded before, and the front more inflated. Length 8.5 mm.; width 3.5 mm.

Vertex, length on middle scarcely greater than at eye, disc depressed somewhat lateral to weak median carina, anterior margin sharp to tylus; tylus, disc slightly elevated, broadly, obtusely rounded before; front, disc strongly convex, moderately inflated, forming a large acute angle with vertex; pronotum, disc flattened, strongly depressed before median line, slightly elevated posteriorly, carina weak except across depressed area, lateral margins parallel; elytra moderately long, costal margins reflexed anteriorly, thence narrowing regularly to acutely angulate apex.

Genitalia: Female, pygofers broadly convex, length one-third greater than basal width, exceeded by ovipositor, which does not reach apex of elytra, as in *saratogensis*. Male, last ventral segment twice length of that preceding, one-half longer than basal width, narrowing apically, disc convex; plates stout, forcep-like, outer margins rounding, inner margins obliquely divergent to black tips.

Color: Varying tawny-brown; vertex darker on tylus; anterior half of pronotum and disc of scutellum lighter; traces of a median light stripe from anterior margin of tylus across vertex and pronotum, traces of oblique bands from scutellum and claval apex toward costal margin; in general quite closely approximating an obscurely marked specimen of *saratogensis* from which it can be separated only by reference to specific structural characters, particularly the shape of the male plates.

Distribution: It has been reported from New York and Ontario (Can.) (Ball), and from North Carolina (Metcalf).

Lepyronia Amyot and Serville.

Vertex, disc weakly convex, strongly sloping, length about equal to width between eyes, anterior margin rounding-rectangulate, apex produced; tylus large, length equal to width; ocelli about equidistant from tylus and pronotum, also about equidistant from eyes and each other; front broad, moderately inflated, acutely angled with vertex and slightly incurved before it, coarsely ribbed lateral to median line; rostrum two-jointed, reaching middle coxae; pronotum, disc weakly convex, sloping, anterior margin slightly rounded, variably depressed behind margin by transverse row of impressions, lateral margins divergent, carinate, length about equal to distance between ocelli, posterior margin deeply, roundly emarginate; elytra coriaceous, broadly convex, costal margins expanded to middle, thence rounding regularly to acutely angulate apex; wings, with the third sector from the marginal

one, forked, the intramarginal vein interrupted between the third and fourth sectors; dorsal surface clothed with a dense, prostrate, grayish-golden pubescence, obscuring the venation of the elytra; in female, last ventral segment reduced to two narrow plates lateral to median line.

The members of this genus, while displaying a marked uniformity in their globose forms, dense pubescence, and coloration of varying grays and browns, the elytra obliquely marked with fuscous, present, however, extreme variability in size (4.5-9.5 mm.), ranging from that of a *Clastoptera* up to that of an *Aphrophora*.

Key to Species.

1. Broader, more convex; color grayish-brown, or testaceous, fuscous markings on elytra indistinct or absent, vertex narrowly angulate, margins straight 2
- Narrower, more elongate; color dusky-gray to deep tawny-brown, a distinct fuscous V on each elytron; vertex broadly angulate, margins convexly rounding to apex **quadrangularis**
2. Size large, 6.5 mm. or more; globose; light grayish-brown, elytra indistinctly marked with fuscous **gibbosa**
- Size small, not exceeding 5.5 mm.; narrow; testaceous, apex of elytra broadly subhyaline **angulifera**

L. quadrangularis (Say). (Pl. iv, 31.) (Fig. 20, 33-36.)

Cercopis quadrangularis Say. Jour. Acad. Nat. Sci. Phila., vi, 305, 1825.

Color dusky-gray to deep tawny-brown, spot at base, spot at apex, and a V on the center of each elytron, fuscous; elongate, the costal margins narrowly expanded. Length 6-8.5 mm.; width 3-3.5 mm.

Vertex, length slightly greater than that of pronotum, apex bluntly rounding; tylus distinctly slightly depressed, almost parallel-margined, length nearly equal to one-half that of vertex; ocelli slightly nearer pronotum than to tylus, slightly nearer each other than to eyes; pronotum, length one-half width; elytra twice longer than wide, the costal margins narrowly expanded.

Genitalia: Female pygofers, length equal to width, outer margins broadly rounded, exceeded by ovipositor by almost one-half their length. Male plates broad at base, equal to last ventral segment in width, length twice width, inner margins attinent, outer margins cut off obliquely at end of basal third, thence rounding to apex, the dorsal appearance that of a V-shaped trough.

Color: Dusky-gray varying to deep tawny-brown; spots at base and apex, and a V on the center of each elytron, formed by the union of an oblique band from the scutellum to a point beyond middle of costa with another from the point of the clavus, fuscous.

Distribution: Specimens have been examined from the New England States, New York, Maryland, District of Columbia, North Carolina, Tennessee, Mississippi, Ohio, Ontario (Can.), Wisconsin, Minnesota, Iowa, Colorado, Nebraska, Indian Territory, and

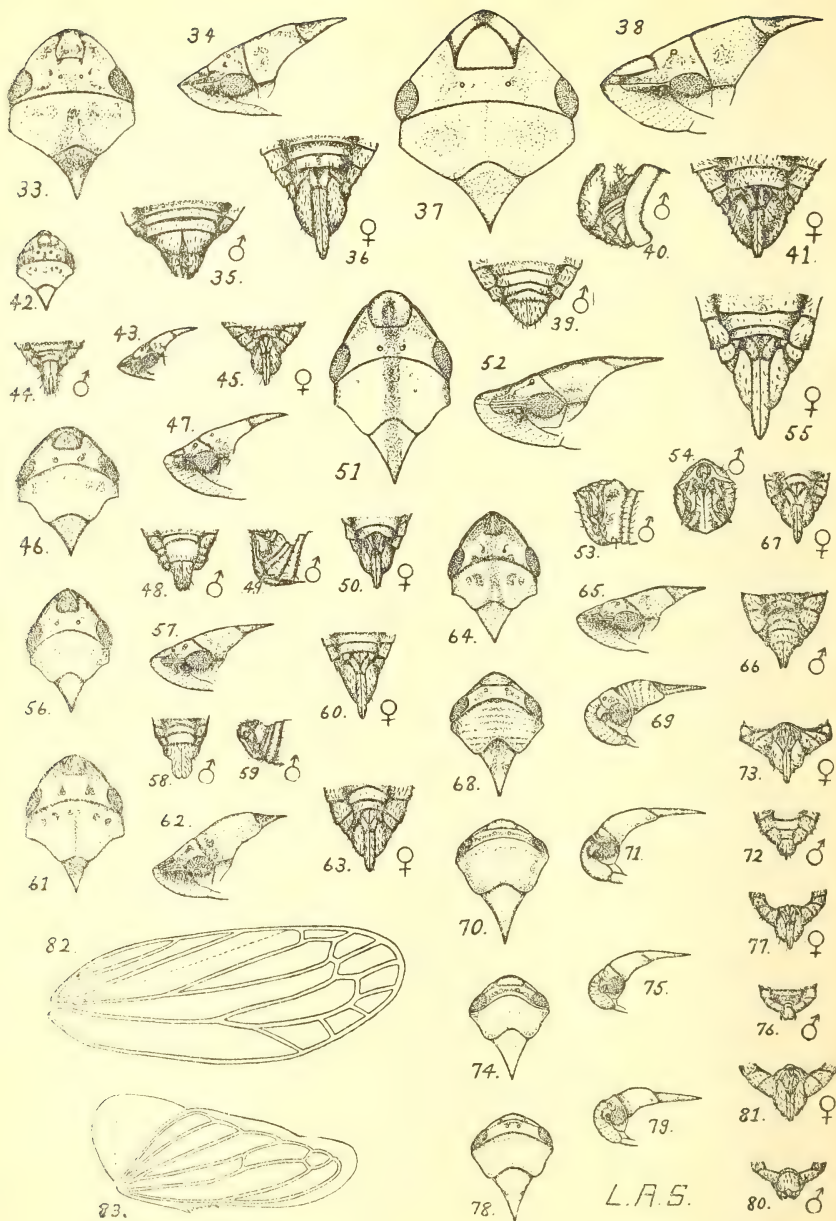


FIG. 20. (33-36) *Lepyrionia quadrangularis* Say,—(33) head, dorsal view, (34) head, lateral view, (35) male genitalia, (36) female genitalia. (37-41) *Lepyrionia gibbosa* Ball,—(37) head, dorsal view, (38) head, lateral view, (39) male genitalia, (40) same, lateral view, (41) female genitalia.

South Dakota. It has been reported from Pennsylvania, West Virginia, Georgia, and Florida (Ball).

Yalesville, 19 Oct., 1903, Westbrook, 30 Aug., 1904 (H. L. V.); New Haven, 6 June, Green's Farms, 24 June, 1904 (W. E. B.); Scotland, 30 July, 1904, Portland, 15 Aug., 1913 (B. H. W.); Stony Creek, 12 Aug., 1904 (P. L. B.); New Canaan, 5 Sept., 1914 (M. P. Z.); Brookfield, 27 July, ? (E. L. D.); North Haven, 4 June, 1917, Ansonia, 20 May, 1918, Kent, 10 May, 1918, Hamden, 18 May, 1919 (M. P. Z.).

L. gibbosa Ball.* (Fig. 20, 37-41.)

Lepyronia gibbosa Ball. Proc. Ia. Acad. Sci., vi, 219, 1898.

Large, general form globose; color foggy-gray to light brown, simulating *quadrangularis* in the fuscous markings of the elytra: costal margins broadly expanded. Length 6.5-9.5 mm.; width 3.5-5 mm.

Vertex, length one-third greater than that of pronotum, apex rounding angulate; tylus distinct, slightly elevated, broad, length equal to that of vertex behind it; ocelli equidistant from tylus and pronotum, also equidistant from eyes and each other; elytra, length one-third greater than width, much wider than pronotum, costal margin deeply deflexed to middle, broadly expanded and narrowly reflexed throughout.

Genitalia: Female pygofers broad and stout, length equal to width, outer margins obliquely angled, distinctly grooved from lateral margins of last ventral segment diagonally to apical third, slightly exceeded by ovipositor. Male, last ventral segment strongly convex; plates equally as convex and as broad at base, shining brown, nearly vertical, inner margins attingent, outer margins incurved slightly at basal third, thence rounding to acute apex.

* Described from type male specimen labeled "Little Rock, Ia. Jy. 2-97"; and specimen labeled "Dismal River, Neb. July."

(42-45) *Lepyronia angulifera* Uhler,—(42) head, dorsal view, (43) head, lateral view, (44) male genitalia, (45) female genitalia. (46-50) *Philaenus spumarius* Linnaeus.—(46) head, dorsal view, (47) head, lateral view, (48) male genitalia, (49) same, lateral view, (50) female genitalia. (51-55) *Philaenus parallelus* Stearns,—(51) head, dorsal view, (52) head, lateral view, (53) male genitalia, (54) same, posterior view, (55) female genitalia. (56-60) *Philaenus lineatus* Linnaeus,—(56) head, dorsal view, (57) head, lateral view, (58) male genitalia, (59) same, lateral view, (60) female genitalia. (61-63) *Phylaronia abjecta* Uhler,—(61) head, dorsal view, (62) head, lateral view, (63) female genitalia. (64-67) *Phylaronia bilineata* Say,—(64) head, dorsal view, (65) head, lateral view, (66) male genitalia, (67) female genitalia. (68-69) *Clastoptera delicata* Uhler,—(68) head, dorsal view, (69) head, lateral view. (70-73) *Clastoptera proteus* Fitch,—(70) head, dorsal view, (71) head, lateral view, (72) male genitalia, (73) female genitalia. (74-77) *Clastoptera xanthocephala* Germar,—(74) head, dorsal view, (75) head, lateral view, (76) male genitalia, (77) female genitalia. (78-81) *Clastoptera obtusa* Say,—(78) head, dorsal view, (79) head, lateral view, (80) male genitalia, (81) female genitalia. (82-83) *Philaenus parallelus* Stearns,—(82) fore wing, (83) rear wing. All greatly enlarged. Drawing by L. A. Stearns.

Color: Foggy-gray varying to light-brown; spot on margin before apex and a V, usually indistinct, on center of each elytron, formed (as in *quadrangularis*) by the union of an oblique band from the scutellum to a point beyond middle of costa with another from the point of the clavus, fuscous.

Distribution: Specimens have been examined from Wisconsin, Nebraska, Iowa, and South Dakota.

L. angulifera Uhler. (Fig. 20, 42-45.)

Lepyronia angulifera Uhler. List Hem. West Miss. River, Bull U. S. Geol. Geog. Surv. Terr., v, 348, 1876.

This species is distinguished readily from the two preceding by its small size, rather narrow form and almost uniform testaceous coloring. Length 4.5-5.5 mm.; width 2.5 mm.

Vertex, length about equal to that of pronotum, one median and two lateral spots before posterior margin, and area at suture with tylus depressed, margins between eyes and tylus somewhat reflexed; tylus indistinct, parallel margined, length one-half that of vertex; ocelli equidistant from tylus and pronotum, also equidistant from eyes and each other; pronotum, length one-half width; elytra, length equal to width across costal margins, disc of corium inflated.

Genitalia: Female pygofers, length equal to width, outer margins rounded, exceeded by ovipositor one-third their length. Male plates broad at base, convex, shining brown, length twice width at middle, inner margins attingent, outer margins obliquely cut off at end of basal third, thence rounded to blunt apex.

Color: Deep testaceous; the indistinct transverse band often reduced to a spot on middle of costal margins; elytra beyond clavus grayish to subhyaline; iridescent from the pubescence.

Distribution: Specimens have been examined from North Carolina. It has been reported from Florida (Ball), and from Maryland and New Jersey (Uhler).

Philaenus Stål.

Vertex, disc slightly convex, sloping in line with pronotum, longer on middle than against eye, greater than one-half length of pronotum, anterior margin obtusely or slightly acutely angulate, between eyes and tylus deeply sulcate and somewhat reflexed; tylus deeply inserted, anterior margin rounding, lateral margins slightly elevated, depressions lateral to weak median carina; ocelli placed close to posterior margin of vertex; front broad, acutely angled with vertex, inflation a slight curve, disc flattened, laterally coarsely ribbed with brown; rostrum short and stout, composed of two equal segments, not exceeding middle coxae; pronotum, disc weakly convex, sloping, with or without a weak median carina, anterior margin rounding angulate, lateral margins short, parallel, equal to or less than distance between ocelli, weakly cari-

nate, posterior margin deeply emarginate; elytra coriaceous, twice longer than wide, parallel-margined or convex; wings, with the third vein from the marginal vein either forked or entire; dorsal surface closely and finely punctate, and clothed with a short, prostrate pubescence; male plates curved dorsally at nearly right angles to abdomen.

Key to Species.

1. Elongate; elytra nearly parallel-margined; anterior margin of pronotum broadly rounded; color constant 2
 Broad and short; elytra strongly convex; anterior margin of pronotum nearly angulate; color variable **spumarius**
2. Size large, 8 mm. or more; pale yellow, conspicuous stripe from anterior margin of tylus, medially across vertex and pronotum, and along suture of elytra to apex, dark brown to black .. **parallelus**
 Size small, not exceeding 6.5 mm.; pale yellow, stripe wanting **lineatus**

P. spumarius (Linnaeus). (Fig. 20, 46-50.)

Cicada spumaria Linnaeus. Faun. Suec. (2d ed.), 240, 881, 1761.

Ptyelus albiceps Provancher. Nat. Can. iv, 351, Hemip. du Can., 258.

Philaenus lineatus Provancher. Hemip. du Can., 258.

Philaenus spumarius Ball. Proc. Ia. Acad. Sci., vi, 224, 1898.

Broad, convex; elytral margins distinctly rounded; head broad and short; color variable. Length 5.5-6 mm.; width 2-2.5 mm.

Vertex short, length equal one-half width, and equal to one-half length of pronotum, anterior margin obtusely angled; tylus broader than long, twice length of vertex behind it; ocelli equidistant from eyes and each other; pronotum with slight depressions in anterior portion of disc, anterior margin nearly angulate, lateral margins less than distance between ocelli; elytra with costal margins strongly convex, reflexed before middle; wings with the third vein from the marginal one forked before the apex.

Genitalia: Female, last ventral segment deeply incurved in median line; pygofers slightly broader than long, outer margins rounded, exceeded by the short ovipositor by one-half their length. Male, last ventral segment three times length of preceding; plates broad at base, width here equal to that of last segment, length twice width, inner margins attingent, outer margins tapering to tip.

Color: This species is exceedingly variable in color, presenting forms which range from pale yellowish white to almost jet black, as described under the following color varieties.

P. spumarius var. **ustulatus** (Fallen).

Grayish-brown; vertex and anterior half of pronotum tawny-yellow; a large spot on the costal margin of the elytra, another slightly smaller and posterior to this, light.

P. spumarius var. **fasciatus** (Fabricius).

Vertex and anterior half of pronotum yellow; remainder of pronotum and elytra dark-brown, with the exception of two large transverse white spots, one anterior and the other posterior to

middle of costal margins, the latter sometimes reaching the claval apex.

P. spumarius var. **leucophthalmus** (Linnaeus).

Entirely dark brown or black.

P. spumarius var. **lateralis** (Linnaeus).

Black; a broad, light stripe on costa.

P. spumarius var. **leucocephalus** (Linnaeus).

Dark brown or black; vertex and anterior half of pronotum yellow.

P. spumarius var. **marginellus** (Fabricius).

Black; vertex and anterior half of pronotum, and a stripe on costal margins of elytra, yellowish white.

P. spumarius var. **lineatus** (Fabricius).

Yellowish-white; a median stripe arising sometimes on point of vertex, sometimes on pronotum, and extending to apex of clavus, and a stripe on corium parallel with this, black.

P. spumarius var. **pallidus** (Zetterstedt).

Pale yellowish white.

Distribution: Specimens have been examined from the New England States, New York, and from Ontario and Quebec (Can.). It has been reported from Nova Scotia (Ball), from North Carolina (Metcalf); and in Europe it has a wide distribution with an even larger number of recognized varieties. Specimens have been examined of the varieties *fasciatus*, *lineatus*, and *pallidus* from "Waterloo, Belgium, 8-'10," of the variety *pallidus* from "Edinburgh, Scotland, 8-19-'12," and of the variety *ustulatus* from "Dalmatia, Saloni, 8-23-'10."

P. parallelus Stearns.* (Fig. 20, 51-55: 82-83.)

Ent. News, xxix, 3, 1918.

Readily distinguished from *spumarius* by its elongate form, and from *lineatus* by its larger size and distinctive coloring, as mentioned in the key to species. Length 8-10 mm.; width 2.5-3 mm.

Vertex, length slightly greater than two-thirds width, medially weakly carinate, laterally depressed; ocelli equidistant from each other and from posterior margin of tylus; pronotum medially weakly carinate, anterior margin broadly rounded, lateral margins equalling distance between ocelli; elytra nearly parallel-margined.

Genitalia: Female, last ventral segment one-half length of preceding, convex; pygofer broad, length equalling combined basal width, outer margin incurved throughout basal third and indented at middle, exceeded by stout ovipositor one-half their length. Male, last ventral segment twice length of preceding, convex; plates long, broad at base, laterally extended here to one-half

* Described from type specimens; male "Medina, Wisc., 23 Aug., 1916, female "St. Croix Falls, Wisc., 15 Aug., 1916.

width of last segment, obtusely notched to one-half basal width at end of basal third, thence tapering to tip as cylindrical processes; black, sparsely clothed with white hairs.

Color: Pale yellow; stripe from anterior margin of tylus, medially across vertex and pronotum, and along suture of elytra to apex, stripe extending from eye across lateral margins of pronotum, following and fading out posteriorly along outer sector of elytron, and sulcate anterior margin of vertex, dark brown to black.

Distribution: Wisconsin (Medina and St. Croix Falls).

P. lineatus (Linnaeus). Grass spittle bug. (Pl. iv, 29.) (Fig. 20, 56-60.)

Cicada lineata Linnaeus. Faun. Suec., 241, 888, 1761.

Cicada abbreviata Fabricius. Ent. Syst., iv, 36, 41, 1794.

Ptyelus basivitta Walker. List Hom. Brit. Mus., 722, 37, 1851.

Small, narrow; head long, angulate; color pale yellow; costa with a light stripe just within which is a black one, which becomes indistinct on posterior half of elytron, black spot of variable extent on suture posterior to apex of clavus. Length 4.5 mm.; width 1.5-2 mm.

Vertex, length equal to two-thirds width, and equal to length of pronotum, nearly right-angled before; tylus narrow, length slightly greater than basal width, and greater than length of vertex behind it; ocelli equidistant from each other and from eyes; pronotum with slight depressions in anterior portion of disc, anterior margin broadly rounded, lateral margins less than distance between ocelli; elytra nearly parallel-margined.

Genitalia: Female pygofer in length equal to basal width, narrowing apically, exceeded by ovipositor one-half their length. Male plates, length three times width, broad at base, laterally extended here to one-half width of last ventral segment, inner margins attingent, outer margins slightly narrowing to beyond middle, then widening to form an obtuse outward angle, thence incurved to blunt tip.

Color: Pale yellow; stripe extending from eye across lateral margins of pronotum, following and fading out posteriorly along outer sector of elytron, and a spot on suture posterior to apex of clavus, sometimes continued around apex of elytra, black.

Distribution: Specimens have been examined from the New England States, New York, and Ontario and Quebec (Can.). It has been reported from St. John, N. B. (Ball). This species, as well as *spumarius*, is widely distributed in Europe, and a number of specimens have been examined collected at "Edinburgh, Scotland, 19 August, 1912."

Scotland, 27 July, 1904, Rainbow, 30 July, 1914 (B. H. W.); Salisbury, 30 Aug., 1904 (W. E. B.); New Haven, 30 July, 1914 (Q. S. L.); 21 Aug., 1909, 29 May, 1921 (B. H. W.); 9 Nov., 1920 (P. G.); Branford, 2 July, 1918, Cornwall, 10 Aug., 1918 (B. H. W.).

Philaronia Ball.

Vertex, disc convex, sloping in line with pronotum, length on middle twice that against eye, surface roughened, anterior margin almost rectangulate, between eyes and tylus deeply sulcate and somewhat reflexed; tylus rounded anteriorly, lateral margins slightly elevated, depressions lateral to weak median carina; ocelli placed close to posterior margin of vertex; front inflated, slightly anteriorly produced, acutely angled with vertex, disc convex, coarsely ribbed lateral to median line; rostrum short and stout, two-jointed, reaching middle coxae; pronotum, disc convex, sloping, anterior margin broadly rounded, lateral margins short, divergent, equal to less than distance between ocelli, weakly carinate, posterior margin emarginate; elytra coriaceous, parallel-margined or convex, twice longer than wide, costal margins sinuate, reflexed before middle, "venation irregular, ramose, the two veins on the corium forking to form discoid cells, which are broken up posteriorly to form an irregular network, which occupies the entire apical portion of the elytra"; dorsal surface closely and finely punctate, sutural lines and venation usually obscured by short, dense, yellow pubescence; genitalia curved dorsally to approximate elytral suture at apex.

This genus, of but two species, was described by Dr. Ball when he founded it, as composed of "stout, heavy-set, somewhat globose forms of moderate size, having the form and dense hairy covering of a *Lepyronia* together with the sulcate vertex of a *Philaenus* and a ramose venation, which is quite distinct from the type of either genus."

Key to Species.

- Stout, compact; elytra broadly convex; color constant, reddish brown **abjecta**
 Elongate; elytra parallel-margined; color variable **bilineata**

P. abjecta (Uhler). (Fig. 20, 61-63.)

Philaenus abjectus Uhler. List Hem. West Miss. River, Bull. U. S. Geol. Geog. Surv. Terr., v, 346, 1876.

Lepyronia angulifera Gillette and Baker. Hem. Colo., 71, 1895.

General form as mentioned in the key to species; width across costal margins of elytra one-third greater than at eyes; color reddish brown, vertex and pronotum lighter. Length 5.5 mm.; width 2.5-3 mm.

Vertex, length slightly greater than one-half width and almost equal to length of pronotum behind it; tylus broadly rounded before, length equal to width and greater than length of vertex behind it; ocelli equidistant from eyes and each other; front inflation and angle with vertex greater than in *bilineata*; pronotum, disc strongly convex, depressed in median line, entire anterior third more or less depressed by a transverse row of pits, posterior margin narrowly emarginate; elytra broadly convex, costal margins strongly curved; pubescence coarse.

Genitalia: Female, last ventral segment convex, one-half length of preceding; pygofers short, stout, outer margins broadly curved, exceeded by broad ovipositor one-third their length. Male, last ventral segment convex, larger than preceding; plates broad at base, vertical, wedge-shaped, apically rounded; male structures in toto more compact than in *bilineata*.

Color: Reddish-brown; vertex and anterior third of pronotum often varying to tawny, with a coarse, long, golden pubescence; remainder of pronotum and elytra deep reddish brown, the costal margins and a larger, obscure area near apex, lighter.

Distribution: Specimens have been examined from Colorado, Nebraska, and North Carolina. It has been reported from South Dakota (Ball).

P. bilineata (Say). (Fig. 20, 64-67.)

Aphrophora bilineata Say. Jour. Acad. Nat. Sci. Phila., vi, 804, 1831.

Philaenus lineatus Uhler. List Hem. West Miss. River, Bull. U. S. Geol. Geog. Surv. Terr., v, 347, 1876.

Philaenus lineatus Gillette and Baker. Hem. Colo., 70, 1895.

Philaenus americanus Baker. Can. Ent., xxix, v, 112, 1897.

Form narrower and more elongate than that of the preceding species; width across costal margins of elytra slightly greater than at eyes; color clay-yellow variably marked with fuscous. Length 5-7 mm.; width 2-2.5 mm.

Vertex long, length on middle two-thirds width and greater than length of pronotum behind it; tylus narrowly rounded before, length greater than width and equal to length of vertex behind it; ocelli slightly nearer each other than eyes; pronotum, disc flattened, weakly convex, two depressed spots lateral to weak median longitudinal depression, posterior margin broadly emarginate; elytra long, parallel-margined, broadly rounded behind.

Genitalia: Female, last ventral segment short, anteriorly strongly incurved in median line; pygofers, length equal to width, outer margins obtusely angled, exceeded by ovipositor one-third their length. Male, length of last ventral segment twice that of preceding, strongly convex, shining; plates vertical, over twice longer than their basal width, inner margins attingent, outer margins strongly sinuate and narrowing from base to small black tips.

Color: Typically clay-yellow variably clouded with fuscous; two longitudinal stripes enclosing a lighter one from anterior margin of tylus medially across vertex and pronotum, and along suture of elytra sometimes to apex, stripe extending from eye across lateral margin of pronotum, slightly inside of outer sector of elytron and fading posterior to middle, sulcate anterior margins of vertex above and below, fuscous; costal margins of elytra dusky white.

Two extremes in coloration occur, linked to the typical form *bilineata* by a complete series of gradational variations, for which I propose the following variety names:

P. bilineata* var. *infuscatus* Stearns, n. var.

Vertex, pronotum and scutellum varying from deep clay-yellow to light fuscous with a median light stripe; in either case, anterior two-thirds of disc of elytra deep fuscous to black, costal margins narrowly and apical areas broadly, white.

P. bilineata* var. *pallidus* Stearns, n. var.

Pale straw-yellow; transverse ribs on front, sulcate anterior margin of vertex above and below, and lateral margins of pronotum, light brown.

Distribution: Specimens have been examined from Maine, Massachusetts, New Hampshire, Connecticut, Ontario and Manitoba (Can.), Iowa, Colorado, Wisconsin, North Dakota, South Dakota, Montana, and Wyoming. It has been reported from Idaho and Nebraska (Ball). The variety forms described as new were taken in Wyoming, Colorado, and Wisconsin localities only.

Brookfield, 27 July, ? (E. L. D.); Thompson, 4 Aug. (A. P. M.); Rainbow, 27 Sept., 1922 (P. G.)

Clastoptera Germar.

The members of this genus in the development of the hind tibiae and the structure and venation of the wings present a high degree of specialization over those preceding; and in the increased freedom of the anterior coxae and the possession of a terminal membrane to the corium approximate the more generalized forms of the Heteroptera.

Form small, globose; extremely variable in size and color markings; head much wider than long, deflected before; vertex sloping, narrow, length on middle about one-third that between eyes, slightly transversely depressed between eyes and lateral to suture with tylus, anterior margin regularly rounded; ocelli placed midway between anterior and posterior margins of vertex; eyes broad, outer and posterior margins sparsely pubescent; front broadly, deeply inserted into vertex, lateral margins of insertion roundly divergent, disc convex, inflated, polished, not longitudinally carinate; antennae inserted in deep cavities between eyes and front, the basal enlargement not extending outside the cavity; rostrum short, composed of two segments, usually but slightly exceeding the middle coxae; pronotum sloping, trapezoidal, broader than long, disc convex, transversely wrinkled, anterior margin broadly rounded, sometimes slightly produced between the eyes, lateral margins short, divergent, rounding back to recurved humeral margins, posterior margin deeply emarginate; scutellum triangular, convex at base, pointed at apex, narrow, length slightly greater than that of pronotum before it; hemelytra narrowly to broadly convex, deflected posteriorly, apices overlapping perpendic-

* Type in author's collection.

ularly, the apex varying from rounding to acutely angulate, clava apex broadly rounded, corium hyaline with a broad terminal membrane, surface clothed sparsely with a fine short pubescence, usually an oval callous dot on margin before apex; posterior tibiae with a single terminal row of spines.

The genitalia of the species in this genus possess so many points of similarity that a single description inclusive of their general characteristics should prove sufficient in connection with the illustrations, Figure 20 (72, 73, 76, 77, 80, 81), which cover in detail any minute specific differences. Female pygofers short and convex, length about equal to greatest width, outer margin rather broadly rounded at base, abruptly indented before apex, exceeded but slightly by the ovipositor, which is carried perpendicular to the plane of the body. Male, last ventral segment very short and convex, outer margins expanded, inner margins attinent to before apex, where they diverge slightly to form rounded lateral angles; males usually smaller and more sombre colored than the females.

*Key to Species.**

1. Hemelytra broadly convex, lateral margins broadly expanded, a distinct callous spot on margin before roundly angulate apex; color and size variable 2
- Hemelytra narrowly convex, lateral margins scarcely expanded, apex acutely angulate, callous spot on margin before apex indistinct or wanting; color uniform straw-yellow varying to pale rufous; size medium to large, length exceeding 4 mm. **osborni**
2. Front strongly inflated, disc sharply, rounded convex, rising abruptly from face at sides 3
- Front moderately inflated, disc broadly flattened-convex, rising gradually from face at sides 4
3. Front more strongly inflated, entirely black or yellow with transverse interrupted black bands above, dark below; pronotum yellow, marked with five transverse black bands, or unicolorous black **delicata**
- Front less strongly inflated, upper two-thirds black, the margin next to vertex narrowly yellow, lower third, lorae, and clypeus yellow; pronotum black varying to yellow **proteus**
4. Size small, not exceeding 3.5 mm.; color uniform above, black varying to glaucous; hemelytra strongly impunctured, sparsely pubescent **xanthocephala**
- Size large, 4 mm. or over; color above varying brown, marked with light testaceous and dusky white; hemelytra minutely impunctured, thickly, finely pubescent **obtusa**

C. osborni Gillette and Baker.

Clastoptera osborni Gillette and Baker. List Hem. Colo., 71, 1895.

Clastoptera obtusa Say. Subsp. iii. *osborni* Ball. Proc. Ia. Acad. Sci., vol. iii, 190, 1895.

Straw-yellow varying to pale rufous, pronotum and clavus tinged with pale olive-green; hemelytra narrowly convex, lateral margins scarcely expanded, apex acutely angulate; size medium to large. Length 4.5-5 mm.; width 2-2.5 mm.

* Modeled somewhat after Ball.

Vertex very slightly transversely depressed, length at middle equal to that at eyes, anterior margin carinately elevated, a distinct circular brownish yellow depression between ocellus and eye on either side; ocelli equidistant from eyes and each other; front moderately inflated, disc broad, flattened-convex, transverse ribbing interrupted in median line by slight longitudinal depression; pronotum three-fourths wider than long, disc strongly convex, distinctly transversely wrinkled, two distinct pits behind elevated anterior margin near median line, lateral to which and directly posterior to inner angles of eyes are two circular brownish yellow spots; scutellum darker; hemelytra narrowly convex, lateral margins scarcely expanded, apex acutely angulate, finely, densely punctured, and clothed with a fine, thickly set pubescence; under surface straw-yellow, spurs and spines only of tibiae and tarsi tipped with black.

Distribution: Specimens have been examined from Colorado, New Mexico, Wisconsin, and Ohio. It has been reported from West Virginia and the District of Columbia (Ball).

C. delicata Uhler. (Fig. 20, 68-69.)

Clastoptera binotata Uhler. Mss.

Clastoptera delicata Uhler. List Hem. Reg. West Miss. River, Bull. U. S. Geol. Geog. Surv. Terr., v, 348-9, 1876.

Clastoptera delicata Ball. Proc. Ia. Acad. Sci., vol. iii, 184-6, 1895.

Clastoptera delicata Ball. Subsp. i. *lineata*, var. a and var. b.

Clastoptera delicata Ball. Subsp. ii. *binotata*.

Clastoptera lineatocollis Stål. ? Eng. Resa. Omk. Jord., iv, 285-6, 1858.

Color pale greenish-yellow varying to black; closely resembling *proteus* in form, but with the front more strongly inflated; two circular yellow depressions on vertex near eyes; pronotum yellow marked with five transverse black bands (var. *lineata*), or unicolorous black (var. *binotata*); size variable. Length 3.5-4.5 mm.; width 2-2.5 mm.

C. delicata var. (i) *lineata* Ball.

Vertex slightly depressed transversely in median line, depressions lateral to tylus reaching entirely across it, a distinct, circular, yellow depression midway between ocellus and eye on either side, anterior margin carinately elevated, bordered from eye to eye with black; eyes margined behind with black; ocelli equidistant from eyes and each other; front strongly inflated, disc sharply, rounded convex, rising abruptly from face at sides; face entirely black (subvar. b), yellow above, transversely marked with interrupted black bands, dark below, lorae yellow, spotted with black below eye and at antennal insertion (subvar. a); pronotum strongly, transversely wrinkled, yellow, transversely marked with five, slightly impressed, narrow black bands, interrupted before lateral margins, anterior margin rather broadly black, posterior margin very deeply emarginate; scutellum yellow, variably obscured by irregular dark fuscous markings; hemelytra with claval margin

and veins strongly elevated and accentuated with pale whitish yellow, the enclosed areas light fuscous (subvar. a), or clavus entirely fuscous (subvar. b), inner claval margin at base, costal margin near base and beyond middle, short oblique stripe on disc, sinuous band enveloping corium anteriorly and reaching to the prominent black callous spot on margin before apex, dark fuscous; dorsal surface varyingly punctate, clothed with a short, sparse, yellow pubescence; undersurface and legs yellow, marked with dark piceous; legs with spurs and spines stout.

C. delicata var. (ii) **binotata** Ball.

Black; a distinct circular yellow depression on vertex between ocellus and eye on either side, a small spot at middle on costal margins, and the tibiae variably spotted with creamy white.

Distribution: Specimens have been examined from Colorado. It has been reported from California and Arizona (Ball), and from Utah (Uhler).

Considerable difficulty is experienced in dealing with this species due to the extreme variability in both size and coloration. As Dr. E. D. Ball (1895) stated, "Uhler's description is an absolutely perfect one for var. i. *lineata* subvar. a, but would apply only slightly to subvar. b, and would absolutely exclude var. ii *binotata*." I have no hesitancy in agreeing with Mr. E. P. Van Duzee (1912) in his conclusion that "*C. lineatocollis* Stål is certainly a distinct species and not a variety of *C. obtusa* (Say) as stated by Dr. Ball." After a careful study of available material it seems highly probable that the description *lineatocollis* refers to those forms included by Uhler and Dr. Ball under the name of *delicata* Uhler, in which case the latter name must be supplanted under the law of priority. However, due to the noticeable vagueness of Stål's description in certain instances and the insufficiency of material at hand, it seems inadvisable to make such a change in nomenclature at present; and I am including *lineatocollis* therefore as a questionable synonym of *delicata*, and have appended hereto the original description of *lineatocollis* for facility of comparison.

ORIGINAL DESCRIPTION OF **C. lineatocollis** Stål.

Eugenies Resa, Omkring Jorden iv, 285-6, 1858.

Dilute sordide flavescens, lineis transversis capitis thoracisque, fascia indistincta laterali pone medium antice a fascia albida terminata, callo apicali nervisque apicis hic illic tegminum, vitta femorum maculisque tibiarum fuscis. Female, length 4 mm.; width 2.5 mm.

C. lineatocollis Stål. Ofv. af K. Vet.-Ak. Forh. p. 253, 1854.

Patria: Cal. (S: t Francisco).

Caput dilute flavescens, verticis marginibus basali et apicali lineisque transversis frontis apicem versus longitrorsum impressae nigrofuscis. Thorax postice profunde angulatosinuatus, medio longitrorsum carinatus, dilute flavescens, lineis pluribus transversis fuscis ornatus. Scutellum flavescens, ante medium vitta fusca, ut littera S fere formata, utrimque ornatum. Tegmina latitudine vix duplo longiora, sordide flavescente-pellucida, medio fascia antrorsum angustata et abbreviata albida, antierius

a linea, postice a fascia indistincta fuscis terminata, callo rotundata fere apicali ad marginem costalem nervisque apicalibus hic illic fuscis. Subtus nigro-varia. Pedes dilute flavescentes, vitta femorum maculisque tibiarum nigro-fuscis.

C. proteus Fitch. (Pl. iv, 30.) (Fig. 20, 70-73.)

Clastoptera proteus Fitch. Cat. Hom. N. Y., 54, 55, 1851.

Clastoptera proteus Fitch. Sub-species *flavicollis*.

Clastoptera proteus Fitch. Sub-species *cincticollis*.

Clastoptera proteus Fitch. Sub-species *maculicollis*.

Clastoptera proteus Fitch. Sub-species *nigricollis*.

Clastoptera proteus Fitch. var. *vittata* Ball. Proc. Ia. Acad. Sci., iii, 186, 1895.

Clastoptera pini Fitch. Cat. Hom. N. Y., 53, 1851.

Clastoptera saint-cyri Provancher. Nat. Can., iv, 351, 1872.

Black, often conspicuously marked with bright yellow; front strongly inflated, disc sharply rounded convex, rising abruptly from face at sides, without transverse striae, upper two-thirds black, lower third yellow; size medium to large. Length 3.5-4 mm.; width 2-2.5 mm.

Vertex very slightly depressed transversely, anterior margin not distinctly carinated; ocelli nearer each other than eyes; front strongly inflated, disc sharply rounded convex, rising abruptly from face at sides, upper two-thirds black, lower third, lorae, and clypeus yellow, a medium black dot on clypeus; abdomen black or fuscous, legs bright yellow, a lateral line on femur, one on each side of tibia, tarsal segments and last segment of rostrum, black; pronotum indistinctly wrinkled transversely, anterior margin but slightly produced between the eyes; hemelytral margins broadly, regularly rounding from base to apex.

New Haven, 4 July, Putnam, 12 July, West Thompson, 12 July, Colebrook, 21 July, 1905 (H. L. V.); Windsor, 26 July, 1905 (W. E. B.); Portland, 14 July, 1914, Hamden, 15 July, 1918 (M. P. Z.).

C. proteus var. *saint-cyri* Provancher (*flava* Ball 1895).

Anterior two-thirds of clavus yellow; scutellum with a yellow spot, or black.

Distribution: Specimens have been examined from Maine, New Hampshire, Massachusetts, Connecticut, New York, Pennsylvania, District of Columbia, Ohio, Wisconsin, Arkansas, Colorado, California, and Ontario and Quebec (Can.). It has been reported from North Carolina (Metcalf).

Brookfield, 27 July, ? (E. L. D.).

C. proteus var. *vittata* Ball.

Clavus yellow with an oblique black vitta through the middle; pronotum variable, with one yellow band anteriorly, with two yellow bands anteriorly, or entirely yellow.

Distribution: Specimens have been examined from Maine, New Hampshire, Massachusetts, Wisconsin, and Ohio.

C. proteus var. *pini* Fitch. (*nigra* Ball 1895).

Clavus entirely black; anterior margin of pronotum narrowly,

vertex and front next to vertex more broadly banded with yellow, or yellow bands wanting, entirely black above, legs darker. Broadly hyaline margin of elytra interrupted behind middle of clavus with darker.

Distribution: Specimens have been examined from Maine, New Hampshire, Massachusetts, Connecticut, New York, District of Columbia, Ohio, Wisconsin, and Ontario and Quebec (Can.). It has been reported from West Virginia and Pennsylvania (Ball).

Brookfield, 27 July, ? (E. L. D.).

C. xanthocephala Germar. (Fig. 20, 74-77.)

Clastoptera xanthocephala Germar. Zeit. für die Ento., 1-189, 1839.

Small; size and coloration relatively constant; dark brown or black above varying to glaucous, usually a small white spot on center of costa; front moderately inflated, disc broadly convex, light above, transversely marked with a broad light band. Length 2.5-3.5 mm.; width 1.5-2.5 mm.

Vertex not strongly depressed, suture with front indistinct; ocelli equidistant from eyes and each other; front with disc more broadly convex than in *proteus*, moderately inflated; pronotum with a large number of fine indistinct transverse wrinkles, anterior margin narrowly rounded and considerably produced between the eyes; hemelytra less convex than in *proteus*, strongly impunctured, very sparsely pubescent, margins narrowly rounding, divergent to apical third, thence abruptly cut off to apex, forming a lateral obtuse angle.

Color: Typical form dark brown or black above, a small white spot on center of costal margin; anterior margin of vertex lighter; front above light, transversely marked with interrupted brown bands, a broad band below these and the greater portion of clypeus dark brown to black, the included portions of front and clypeus, and lorae, margin of anterior coxal fossae, yellow; abdomen black, legs varying light brown to black, spurs and spines tipped with black.

C. xanthocephala var. *glauc*a Van Duzee.

Pale glaucous or grayish above.

Distribution: Specimens have been examined from Massachusetts, Tennessee, Mississippi, North Carolina, South Carolina, Maryland, District of Columbia, Ohio, Georgia, Texas, Louisiana, Indian Territory, Arizona, Arkansas, and Maine. It has been reported from Florida, Virginia, Pennsylvania and Iowa (Ball).

C. obtusa (Say). Alder spittle bug. (Fig. 20, 78-81.)

Cercopis obtusa Say. Jour. Acad. Nat. Sci. Phila., iv, 339, 1825.

Clastoptera achatina Germar. Zeitschr. für die Ent., i, 187, 1839.

Clastoptera testacea Fitch. Ninth Rep. St. Ent. N. Y., 393, 1851.

Clastoptera obtusa Ball. Proc. Ia. Acad. Sci., vol. iii, 188-91, 1895.

Clastoptera obtusa Ball. Subsp. i. *obtusa* Ball.

Large, oblongate; color varying brown, marked with light

testaceous and dusky white; front moderately inflated, disc broad, flattened-convex, light above, marked with nine transverse, interrupted, dark brown bands. Length 4-4.5 mm.; width 2-2.5 mm.

Vertex very strongly transversely depressed in median line, anterior margin prominently carinate; ocelli situated near anterior margin, about equidistant from eyes and each other; front moderately inflated, disc broad, flattened-convex, obtusely angulate with vertex, light above, marked with nine, transverse, interrupted, dark brown bands, dark below, sometimes with a transverse light band; pronotum broad, disc slightly depressed behind elevated anterior margin, with numerous, minute, distinct wrinkles; hemelytra minutely impunctured, clothed with a fine thick pubescence, lateral margins but slightly divergent, abruptly cut off apically; under surface black; legs stout, black variably marked with lighter.

C. obtusa var. obtusa Ball.

Coloration very variable so that two extremes may be found: (1) Dark; a distinct, oblique light band from scutellum to beyond middle on costal margins, which are narrowly white before; scutellum varying light to dark brown; vertex light, anterior margin from eye to eye darker; pronotum dark posteriorly, anterior two-thirds lighter, the anterior margin and a transverse band, brown. (2) Light; same markings as above, only much lighter and less distinct.

Distribution: Specimens have been examined from Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, District of Columbia, North Carolina, South Carolina, Tennessee, Ohio, Wisconsin, Minnesota, Iowa, Illinois, Kansas, Colorado, and California. It has been reported from West Virginia and Ontario (Can.) (Ball).

Yalesville, 19 Oct., 1903; Sachem's Head, 1 Aug., 1904; New Haven, 4 Aug., 1904; Poquonock, 27 June, 1905 (H. L. V.); Scotland, 30 July, 1904; Canterbury, 14 Aug., 1905, Poquonock, 27 June, 1905, New Haven, 27 Aug., 1906, North Haven, 15 July, 1910 (B. H. W.); Westville, 15 July, 1905, New Canaan, 14 Sept., 1905 (W. E. B.); East River, 6 Aug., 1908 (C. R. E.); Brookfield, 27 July, ? (E. L. D.); Winnipauk, 4 Aug., ? Kent, 10 Aug., 1918, New Canaan, 11 Sept., 1914 (M. P. Z.); New Haven, 15 June, 1922 (P. G.).

C. obtusa var. achatina Germar.

Dark, dorsal color markings absent; head, pronotum, and scutellum fulvous; hemelytra varying fuscous, apical nervules accentuated; front below and clypeus banded with light transversely.

Distribution: Specimens have been examined from Pennsylvania, Ohio, Indiana, and Wisconsin.

Brookfield, 27 July, ? (E. L. D.); New Haven, 7 Sept., 1922 (P. G.).

C. obtusa var. testacea Fitch.

This particular form is unknown to me, and, following the

custom adopted by Dr. Ball and other workers on this family, I have considered it as a variety form of *obtusa* and appended the original description hereto.

"Testaceous; scutel rufous; elytra with a polished callous-like black dot near the apex. Length 0.20 inches."

Distribution: It has been reported from New York (Fitch), and from West Virginia, District of Columbia and New Jersey (Ball).

Rainbow, 27 Sept., 1922 (P. G.).

Under *delicata* Uhler, I have already stated, in agreement with Van Duzee (1912), that *lineatocollis* Stål is distinctly not a subspecies of *obtusa* (Say) as thought by Dr. Ball, but rather appears to me a probable synonym of *delicata*. A specimen determined by him as *obtusa* subsp. *lineatocollis* may be placed readily as a dark form of *obtusa* var. *obtusa*.

Mr. Van Duzee (1912) states that var. *achatina*, as included by Dr. Ball under *obtusa* subsp. *obtusa*, is not the true *achatina* Germar; and he proposes the variety name *tristis* for this form, together with *proteus* Provancher (1889). I cannot follow Van Duzee in this instance, having examined a specimen determined by Dr. Ball as the above form, which answers the description of *achatina* Germar in every particular. The form *achatina* appears to me, however, as quite distinct from *obtusa* var. *obtusa* and is another variety of *obtusa*, as placed by Van Duzee.

Osborni Gillette and Baker appears to be a distinct species as listed in Van Duzee's "Check List—1916" rather than a subspecies of *obtusa*, as placed by Dr. Ball. In this consideration of *osborni* as a distinct species, I have also accepted Van Duzee's placing of *pini* Fitch as a variety of *proteus* supplanting the variety name *nigra*, as proposed by Dr. Ball.

With these alterations, *C. obtusa* (Say) is presented above with the varieties *obtusa* Ball, *achatina* Germar, and *testacea* Fitch.

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Family CICADIDAE.

BY WILLIAM THOMPSON DAVIS.

This family contains the well known "periodical cicada," incorrectly called a "locust," also the "harvest flies." In some parts of our country these insects are called "jar-flies" and "singers." They are readily distinguished from all other native Homoptera by their large size and the ability of the males to produce a shrilling sound, which differs for each species often quite as markedly as the songs of various kinds of birds. This song is produced in the males by the rapid vibration of the timbals situated at the base of the abdomen. Strong muscles are attached to these organs and when the insect is in full song the whole body is often seen to vibrate. The eggs are laid either in the small branches of trees and in lesser plants, as in the case of the periodical cicada, or in the bark of the trunk, or in old dead branches, etc., as in most of the other species. From these situations the larvae, when hatched, fall to the ground, burrow, and suck sap from the roots of trees, bushes and herbaceous plants for many years, for they grow but slowly. The length of the life cycle of most of our species is unknown, that of the periodical cicada, from the fact that the same brood appears once every seventeen years, being the only one about which a definite statement can be made.

The members of this family have three ocelli, placed in the form of a triangle on the summit of the head between the compound eyes. The antennae have a short basal joint, surmounted by a hair-like process divided into about five parts or segments. The front femora are armed with teeth.

As far as is known at present, there are but nine species of cicadas belonging to three genera* found in the Northeastern United States, seven of which are to be found in Connecticut.

Key to Genera.

1. Tympanal coverings absent 2
Tympanal coverings entirely concealing tympanal orifices. Head broad; eyes prominent **Tibicen**, p. 239
2. Head, including eyes, about as broad as base of mesonotum **Tibicina**, p. 241
Head, including eyes, considerably narrower than base of mesonotum; uncus always exposed **Okanagana**, p. 242

Tibicen Latreille.

The species of this genus found in Connecticut are large, black and greenish colored insects with heads broader than base of mesonotum. The first and second cross veins of the fore wings are generally clouded in mature individuals, and the first cross vein starts far back from radius 3, that is, nearer to the base of the wing than in some other genera.

Key to Species.

1. Abdomen beneath with a broad, shining median stripe 2
Abdomen beneath without broad, shining median stripe 4
2. Hind margin of the pronotum or collar, greenish; body black and greenish 3
Hind margin of pronotum black; wing expanse about 95 mm.; body black and brownish green **lyricen**
3. Wing expanse about 85 mm.; costal margin of fore wing rather suddenly bent near the middle **linnei**
Wing expanse about 75 mm.; costal margin of fore wing an even curve **canicularis**
4. Wing expanse about 115 mm.; opercula short and rounded **auletes**
Wing expanse about 95 mm.; opercula much longer than broad **chloromera**

T. auletes (Germar). (Pl. v, 7 and 8.)

Silb. Rev. Ent., ii, 65, 1834.

This may be *Cicada grossa* Fabricius, but in the original description the habitat of that species is given as Brazil.

Tibicen auletes is the largest cicada in Northeastern North America and may be readily distinguished by that character alone. Its general coloring is olive-green and black with the hind margin of the pronotum or collar entirely olive-green. In fresh specimens the dorsal surface of the abdomen has the basal and two terminal segments pruinose, leaving four segments between, black. At least in the northern part of its range this species seems to be partial to sandy situations. Its song is monotonous and without much vim to it, and of a hot summer's day a number of them may sometimes be heard singing together about four or five o'clock in the afternoon.

* The generic names here used are those of the recently published list of Hemiptera by Edward P. Van Duzee.

New Haven, 21 Aug., 1905 (W. E. B.); 15 July 1911 (A. B. C.); 21 July, 7 Aug., 1911 (B. H. W.).

T. canicularis (Harris). (Pl. v, 5.)

Rept. Ins. Mass., 175, 1841.

This is the most common species of cicada in Connecticut and in the New England States generally. It is found in pine woods and in the deciduous forest. It most closely resembles *Tibicen linnei*, but is generally much smaller with less prominent eyes and with the tergum less shining black. The costal margins of the fore wings are not as suddenly bent near the middle as in that species, but present a more even curve. Also its song is different from that of *linnei*, being much more shrill.

Washington (Mrs. A. T. Slosson); East Hartford, 9 Aug., 1904 (B. H. W.); Manchester, 9 Oct., 1907 (G. H. H.); 13 Sept., 1910 (A. B. C.); New Canaan, 21 Sept., 1909 (B. H. W.); 11 Sept., 1910 (A. B. C.); Wallingford, 22, 28, 29 July, 6, 23 Aug., 1910 (D. J. C.); Hamden, 23 Aug., 1909 (B. H. W.); South Meriden, 1, 28 Sept., 1912 (H. L. J.); Branford, 18 Aug., 10 Sept., 1905 (H. W. W.); New Haven, 29 Aug., 1892 (A. P. M.); 6 Oct., 1902, 7 Aug., 1906, 29 Aug., 1909, 16 Aug., 1910, 5 Aug., 1911 (B. H. W.); 11 Aug., 1905 (V. L. Churchill); 30 Aug., 1907 (C. E. Olsen); 1 Sept., 1909 (A. I. B.); 11, 28 Sept., 1909 (G. H. H.); 21 Aug., 1911 (A. B. C.); 26 Aug., 1913 (Q. S. L.); 7 Sept., 1904, 20 Aug., 1905, 9 Sept., 1907, 10, 31 Aug., 1908, 26 Aug., 1909 (W. E. B.).

T. linnei (Smith and Grossbeck). (Pl. v, 4.)

Ent. News, xviii, 127, 1907.

This species has so far been reported only from the southern part of Connecticut, and does not appear to be generally distributed in the New England States, though occurring in some of the counties of New York State immediately west of Massachusetts. Its generally larger size, more prominent eyes and shining surface of the dorsum of the abdomen, and above all the bent costal margins of the fore wings, will serve to distinguish it from *canicularis*.

Greenwich, 23 Aug., 1892 (A. P. M.); New Canaan, 10 Sept., 1914 (B. H. W.); Wallingford, 6 Aug., 1910 (D. J. C.); New Haven, 21 Sept., 1907 (B. H. W.); and Sept. (C. E. Olsen); Branford, 4 Aug., 1905 (J. L. Zabriskie); and 9 Sept., 1905 (H. W. W.).

T. lyricen (Degeer). (Pl. v, 3.)

Memoires iii, 212, 1773.

Next to *canicularis* this is the most plentiful species of cicada in Connecticut and has a considerable distribution in the New England States. It may be separated from its allies found in New England by its black collar (hind margin of pronotum), and the tawny colors of the fore part of the pronotum and on the mesonotum. The legs are also tawny in color and the opercula are proportionately longer (usually about 7 mm.) than in either *linnei* or *canicularis*.

Canaan, 19 Aug., 1894 (C. F. Baker); Washington, 6 Aug. (Mrs. A. T. Slosson); Farmington, 12 Aug., 1909 (W. E. B.); Stamford, 13 Aug.,

1891 (A. P. M.); 16 Aug., 1912 (W. E. B.); New Canaan, 19 Sept., 1905, 21 Sept., 1909 (B. H. W.); 10 Sept., 1908, 20 Sept., 1909 (W. E. B.); 5, 11 Sept., 1914 (M. P. Z.); South Britain, 1884 (G. F. Pierce); South Meriden, 11 July, 1913 (H. L. J.); Wallingford, 14 July, 1910 (D. J. C.); New Haven, 17 June, 1906, 8 Aug., 1911 (W. E. B.); 27 July, 1913 (G. P. Clinton); Portland, 9 Aug., 1913 (B. H. W.); Durham, 16 Sept., 1910 (D. J. C.); Lyme, 5 Aug., 1911 (A. B. C.); Stonington, 8 July, 1906 (J. A. H.); Aug., 1909 (W. T. Davis); 8 Aug., 1914 (I. W. D.).

T. lyricen var. **engelhardti** (Davis).

Ent. News, xxi, 458, 1910.

The pronotum and mesonotum are entirely black except a tawny spot in the central portion of the former. This variety is the form found in the mountains of Virginia, North Carolina, and Georgia, which in the northern part of the range of the species is to be occasionally met with near the coast.

New Canaan, 19 Sept., 1910 (D. J. C.).

T. chloromera (Walker) *sayi* (Smith and Grossbeck). (Pl. v, 6.)

List. Homop., 143, 1850.

This is not a common species in Connecticut, but is more southern in its distribution, being the most plentiful species about the city of New York. It is without the median shining longitudinal band on the underside of the abdomen, present in *lyricen*, *linnei*, and *canicularis*, and the opercula are very long, usually about 10 mm. The eyes are less prominent than in the three species mentioned, and the collar is usually black, with an olive-green irregular spot near each humeral angle.

Greenwich, 23 Aug., 1892 (C. F. Baker); Stamford, 13-17 Aug., 1891, 22 Aug., 1894 (A. P. M.).

Tibicina Kolenati.

The periodical cicada or "seventeen-year locust" is the sole representative of this genus to be found in Connecticut. In addition to the characters given in the key to genera it may be added that the first and second cross-veins of the fore wings are infuscated and that the first cross vein *usually* joins radius 3 quite far back, that is, nearer the base of the wing than in the next genus. The basal cell of the fore wing is very small, usually about 2.5 mm. in length.

T. septendecim (Linnaeus). Periodical cicada. Seventeen-year locust. (Pl. v, 1 and 2; egg scars, Pl. xix, 2.)

Syst. Nat., Edn. 10, 436, 1758.

In addition to being called "periodical cicada" and "seventeen-year locust," this species is sometimes known as the "red-eyed cicada," or "red-eyed locust," because in life the eyes are conspicuously red. The dorsum of the abdomen is black; the membranes at the base of all of the wings are deep orange, as are the costal margins of the fore wings. The veins are more smoky or clouded than in any other Connecticut cicada and there is often a clouded

band extending along the hind margins of both pairs of wings. It occurs earlier than the species thus far considered, being essentially a June cicada.

Only two of the seven or eight broods known to occur in the northeastern United States have so far been reported from the State. These are broods ii (1911-1928), which has been reported from Fairfield, Hartford, Litchfield, Middlesex, and New Haven counties, and is the chief seventeen-year cicada brood of the State, and brood xi (1903-1920), which has been recorded from Hartford County, also from Rhode Island and Massachusetts. A full account of the occurrence of brood ii in 1911 may be found in the Report of the Connecticut Agricultural Experiment Station for that year, page 296.

T. septendecim var. cassinii (Fisher).

Proc. Acad. Nat. Sci. Phila., v, 272, 1851.

A small form or variety of this species, known as *cassinii* (Fisher), often occurs with the typical *septendecim*, and is usually not distributed over the entire range of the appearing brood, but is more local. It is generally darker beneath, the w-mark on the fore wings is not so conspicuous and the eyes are more prominent in many of the individuals, otherwise it is only to be distinguished from *septendecim* by being about one-third smaller.

Okanagana Distant.

The head is small in this genus; both the fore and hind wings are hyaline with the basal cell of the former long and narrow (about 3 mm.); the first and second transverse veins of the fore wings are unclouded, the first usually joining radius 3 nearer the middle than in *Tibicina*. The opercula are small and transverse, and the uncus cannot be withdrawn into the abdomen.

O. rimosa (Say).

Jour. Acad. Nat. Sci. Phila., vi, 235, 1830.

This is the smallest species of cicada to be found in the New England States and is quite generally distributed. Like the seventeen-year species its first appearance is earlier than that of the other five species, and in the Highlands of the Hudson it emerges during the first part of June. The membranes at the base of both pairs of wings are deep orange or red in color, and there are also red spots on the head, pronotum and mesonotum; the hind border of the pronotum is red and each abdominal segment is also bordered with red. The song is weak and reminds one of that of some Orthopterous insect, like one of the smaller species of *Neoconocephalus*, and is quite different from the "Pha-r-r-r-r-ach" and other notes produced by the seventeen-year species. This species has not been recorded from Connecticut, but will probably be found in the hilly portion, as it occurs in both the adjoining States of New York and Massachusetts.

Family PSYLLIDAE (or CHERMIDAE).

BY EDITH MARION PATCH, PH.D.

The psyllids have something the appearance of miniature Cicadas. They come very near the aphids in their feeding habits, occurring for the most part on stem or leaf of plants, sometimes exposed but usually protected by flocculent wax secretion or by a deformation of the part of the plant affected and often in a definite gall. They are sometimes called "jumping plantlice" as their hind legs are formed for leaping. Perhaps the average size for the New England species would be about four or five millimeters in length though the different species vary from shorter to longer than that. The details of their structure make them a very fascinating group for microscopic study. Their feeding habits cause such species as appear on economic vegetation in large numbers to be rated as pests which need to be reckoned with. For the most part there is nothing erratic in their life cycles and both sexes appear with each generation. They are oviparous.

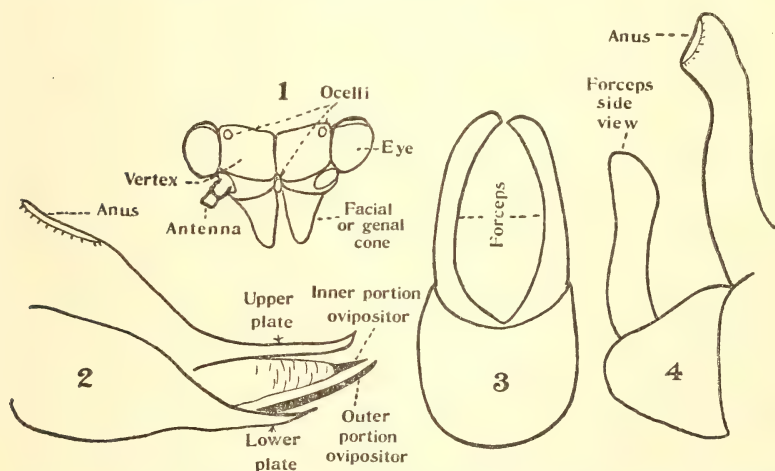


FIG. 21. Psyllid structures: (1) head, front view; (2) cauda of female, lateral view; (3) cauda of male, rear view; (4) cauda of male, lateral view. All greatly enlarged. Drawing by Dr. Edith M. Patch.

Key to Genera.

- | | |
|--|--------------------------|
| 1. Head not or scarcely deflexed; genae without conical process | 2 |
| Head deflexed; genal cones present | 3 |
| 2. Eyes flattened; cephalic portion of head thin | <i>Livia</i> , p. 244 |
| Eyes more or less hemispherical; cephalic portion of head thick | <i>Aphalara</i> , p. 244 |
| 3. Wing with M and Cu separating distad from point of juncture with R. Fig. 24 | 4 |

- Wing with R. M. and Cu branching from stem vein at same place.
 Fig. 22 *Trioza*, p. 245
4. Genal cones swollen or blunt, not forming conspicuous tapering flaps; food plants restricted 5
 Genal cones usually produced to form conspicuous tapering flaps; food plants various 6
5. Genae swollen, usually with cones present; species all developing on sumach (*Rhus*) *Calophya*, p. 246
 Genal cones small, blunt, subconical, divergent; species all developing in galls on hackberry (*Celtis*) *Pachypsylla*, p. 246
6. Wings with distal portion somewhat tapering, with Rs extending to apex. Fig. 24 *Spanioneura*, p. 247
 Wings with distal portion bluntly rounded, and Rs at margin not nearer apex than the proximal branch of M. Fig. 24 .. *Psylla*, p. 247
 and *Psylloptis*, p. 250

Livia Latreille.

Descriptions and figures of the three species here considered were published in *Psyche* (Patch 1912a).

Key to Species.

1. Distal margin of fore wings with conspicuous smoky band 2
 Fore wing about uniformly feebly transparent, dull brownish yellow *vernalis*
2. Veins of fore wing white alternating with numerous black rings *maculipennis*
 Veins of fore wing not ringed with black *marginata*
- L. vernalis** Fitch. *Diraphia femoralis* Fitch. *D. calamorum* Fitch. *Livia saltatrix* Provancher. (Pl. vi, 3.)
 Homop. N. Y. St. Cab., 64, 1851.

Food plant of nymph is not known. Adult found on leaves of pine and on sweet-flag (*Acorus calamus*) by Fitch.

North Haven, 15 July, 1910 (B. H. W.); Manchester, 17 Aug., 1916 (M. P. Z.).

- L. maculipennis** (Fitch). *Diraphia maculipennis* Fitch. *Livia bifasciata* Provancher. (Pl. vi, 1.)

Trans. N. Y. Agr. Soc., xvii, 740, 1857.

Nymphs develop in gall on rush (*Juncus* sp.) as recorded in *Psyche* (Patch 1916a).

New Haven, 13, 30 May, 1911 (B. H. W.).

- ***L. marginata** Patch.

Psyche, xix, 8, 1912.

Type locality: Colebrook, 21 July, 1905 (H. L. V.).

Aphalara Foerster.

Descriptions and figures of the species here considered were published by the Maine Agricultural Experiment Station (Patch 1911 and 1912b).

Key to Species.

1. Wings without conspicuous dark band 2
 Wings with conspicuous dark submarginal band across apical half of wing **fascipennis**
2. Female with dorsal plate of cauda strongly arched, curved downward at tip **calthae**
 Female with dorsal plate nearly straight lined **veaziei**

A. fascipennis Patch.

Me. Agr. Expt. Sta., Bull. 202, 217, 1912.

Nymphs and food plant are not known.

A. calthae (Linnaeus). *Aphalara polygoni* Foerster (Patch 1911).

Fauna Suec., Edn. 2, 263, 1761.

Nymphs feed upon *Polygonum*, most numerous at leaf axle.

A. veaziei Patch.

Me. Agr. Expt. Sta., Bull. 187, 16, 1911.

Nymph and food plant not known. Adults commonly taken on *Solidago*.

New Haven, 8 June, 1904; on *Solidago*, Stafford, 24 Aug., 1905 (W. E. B.).

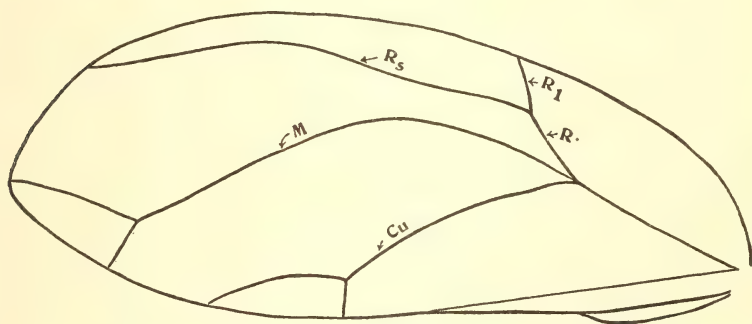


FIG. 22. Wing of *Trioza tripunctata* Fitch. Greatly enlarged. Drawing by Dr. Edith M. Patch.

Trioza Foerster.*Key to Species.*

- Fore wing heavily shaded along veins; M and Cu both branching very near margin of wing. Fig. 22 **tripunctata**
 Fore wing with veins not shaded; three dark marginal dashes between anterior branch of M and posterior branch of Cu.
 Neither M nor Cu branching near margin of wing **obtusa**

T. tripunctata (Fitch). *Psylla tripunctata* Fitch. *Psylla rubi* Walsh and Riley. (Fig. 22.)

P. celtidis-gemma Riley. (Pl. vi, 5.)

Proc. Biol. Soc. Wash., ii, 74, 1884.

Common on hackberry.

East Wallingford, 6 July, 1904; New Haven, 25 June, 1905 (W. E. B.); Branford, 5 June, 1908 (B. H. W.).

P. venusta (Osten Sacken). *Psylla venusta* Osten Sacken.*Pachypsylla tridentata* Patch.

Stet. Ent. Zeit., xxii, 422, 1861.

On hackberry.

Galls, Branford, 5 June, 1908 (B. H. W.).

P. celtidis-mamma Riley. (Pl. vi, 4.)

Proc. Biol. Soc. Wash., ii, 73, 1884.

For detailed description see Stough (1910) and for discussion see also Crawford (1914). Common on hackberry.

Oxford, 21 May, 1904; Westville, 18 June, 1904, 7 Sept., 1905 (W. E. B.); galls, New Haven, 5 June, 1903 (W. E. B.).

P. celtidis-vesiculum Crawford.

U. S. Nat. Mus., Bull. 85, 112, 1913.

On hackberry.

Galls, Westville, 7 Sept., 1905 (W. E. B.).

Spanioneura Foerster.**S. fonscolombii** Foerster. (Fig. 23.)On boxwood (*Buxus*).

Pomfret, 29 May, 1915. For further account see Britton (1916).

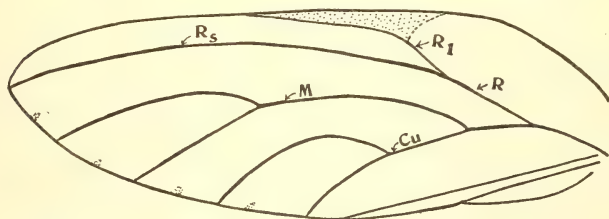


FIG. 23. Wing of *Spanioneura fonscolombii* Foerster. Greatly enlarged. Drawing by Dr. Edith M. Patch.

Psylla Geoffroy.*Key to Species.*

1. Antenna less than two and one-half times as long as width of head 2
- Antenna at least two and one-half times as long as width of head 7
2. Cauda of female with dorsal plate curving downward at tip 3
- Cauda of female with dorsal plate not curving downward at tip .. 4
3. Genital segment of female less than half as long as rest of abdomen

pyricola

- Genital segment of female at least nearly as long as rest of abdomen **hartigii**
4. Dorsal plate of female cauda not with bulb-shaped nodules; if cuticular processes are present they are of some other shape 5
Dorsal plate of female cauda with lower margin thickly set with bulb-shaped nodules **buxi**
5. Genital segment of female shorter than rest of abdomen 6
Genital segment of female at least as long as rest of abdomen .. **striata**
6. Antenna conspicuously annulated with black **annulata**
Antenna uniformly yellowish, except terminal segment black **negundinis**
7. Dorsal plate of female without dark nodules 8
Dorsal plate of female cauda armed with large blunt dark cuticular processes which give it a decidedly noded appearance **cerasi**
8. Dorsal plate of female not rounded at tip 9
Dorsal plate of female gently rounded at tip **galeaformis**
9. Dorsal plate of female tapering to point at tip **carpinicola**
Dorsal plate of female cauda abruptly tilted up at tip **floccosa**

P. pyricola Foerster. Pear psylla. (Pl. vi, 2.)

Verh. Natw. Ver. Preuss. Rheinl., v, 77, 1848.

Of economic importance, causing considerable injury to the pear crop. Nymphal stages passed on pear leaves. Common throughout the State.

Hartford, 7 July, 1903; Portland, 14 July, 1903; New Haven, 16 July, 1903; 16 Oct., 1903 (H. L. V.); 13 July, 1914 (M. P. Z.); Hamden, 18 July, 1903; West Granby, 4 Aug., 1903; Woodbury, 6 Aug., 1903; South Windsor, 8 Oct., 1903; Cheshire, 17 February, 1904; Wolcott, 18 April, 1904; Hartford, 15 June, 1904; Berlin, 22 Nov., 1905 (W. E. B.); Guilford, 1 Aug., 1906; New Britain, 4 Oct., 1910; Mystic, 12 Aug., 1912; Cheshire, 28 July, 1914, 27 Aug., 1915.

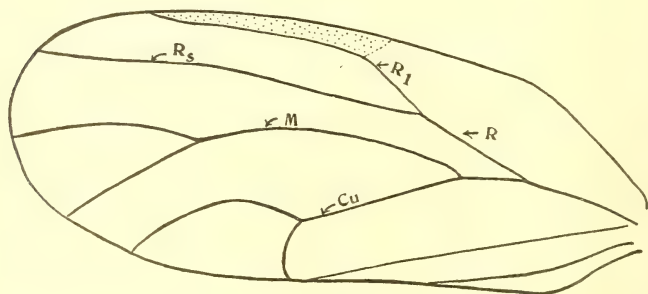


FIG. 24. Wing of *Psylla striata* Patch. Greatly enlarged. Drawing by Dr. Edith M. Patch.

P. hartigii Flor.

Rhyn. Livl., ii, 469, 1861.

Nymphal stages passed on birch (*Betula*). The caudal segment of female is much like *galeaformis* except for the constant downward curve of the long dorsal plate. Crawford (1914) and Patch (1912).

P. buxi (Linnaeus).

Syst. Nat., Edn. 10, i, 454, 1758.

Nymphal stages passed on boxwood (*Buxus*).

Pomfret, 29 May, 1915. For further account see Britton (1916).

P. striata Patch. (Fig. 24.)

Me. Agr. Expt. Sta., Bull. 187, 1911.

Nymphal stages passed on birch (*Betula*).

New Haven, 10 June, 1910 (B. H. W.); Colebrook, 21 July, 1905 (H. L. V.).

P. annulata Fitch.

Homop. N. Y. St. Cab., 64, 1851.

Nymphal stages passed on maple. Similar to *P. negundinis* but readily distinguished by ringed antenna and the fact that it seems to be restricted to maple. Nymphs abundant on maple (*Acer saccharum*).

Middletown, 17-31, May, 1911. Nymphs usually but not always on ventral side of leaf which they resemble closely in color. Adults collected May 30-31 and by middle of June were found alighting on other vegetation (W. C. W.).

P. negundinis Mally.

Proc. Ia. Acad. Sci., ii, 155, 1894.

Nymphal stages passed on box elder (*Negundo*).

P. cerasi Patch.

Me. Agr. Expt. Sta., Bull. 202, 1912.

Nymphal stages passed on bird cherry (*Prunus pennsylvanica*) occurring in flocculent masses on ventral surface of leaf. Adults pale early in the season but richly colored in fall. Eggs are laid in September between leaf bud and twig.

P. galeaformis Patch.

Me. Agr. Expt. Sta., Bull. 187, 1911.

Nymphal stages passed on alder (*Alnus*). The genital segments of both sexes readily distinguish the adults from *floccosa*.

Middletown, 13 June, 1911, on *Alnus incana* (W. C. W.).

P. carpinicola Crawford. *Psylla carpini* Fitch.

U. S. Nat. Mus., Bull. 85, 151, 1914.

Resembles *striata* but with longer genal cones and wings less flavous.

P. floccosa Patch.

Can. Ent., xli, 301, 1909.

Nymphal stages passed on leaf and new growth twig of alder (*Alnus*). Wax filaments of nymphs very soft and plumelike in appearance.

Hamden, 17 June, 1904; Putnam, 12 July, 1905 (H. L. V.); Windsor, 19 June, 1905 (W. E. B.); Middletown, 13 June, 1911 (W. C. W.).

Psyllopsis Fr. Loew.*P. fraxinicola* (Foerster). (Pl. vi, 7.)

Verh. Natw. Ver. Preuss. Rheinl., v, 73, 1848.

Pale yellowish green psyllid with moderately long genal cones and long slender antennae. On green ash.

Storrs, 24 Aug., 1909 (W. E. B.).

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1911. Psyllidae, in Bulletin 187. Maine Agricultural Experiment Station.

1912a. Notes on Psyllidae: *Livia*. Psyche, 19: 5-8.

1912b. Notes on Psyllidae. Bulletin 202, Maine Agricultural Experiment Station.

1916a. A Psyllid Gall on *Juncus* (*Livia maculipennis* Fitch) Psyche, 23: No. 1.

Stough, H. B. 1910. The Hackberry Psylla, *Pachypsylla c.-mamma*. Kansas University Science Bulletin, 5: 121-165.

Family APHIDIDAE.

BY EDITH MARION PATCH, PH.D.*

On account of their small size aphids are to a great extent unnoticed; but when conditions are favorable to their increase there are many species of these little creatures that are capable of serious damage to the vegetation which they frequent and staple crops often suffer severely.

These insects occur in winged and wingless forms and both feed by means of a jointed beak which they push into the tissues of the plant in order to suck up the sap which forms their food. They range from a little more than one-half a millimeter to about six millimeters in length. Some are sporadic in habit, while some live in gregarious colonies on stem or leaf or roots as their food plant. Some are exposed but many are protected by curled leaves or definite gall growths their presence causes.

Although the life cycle varies greatly for different species of aphids, the following points seem of most significance for a general statement.

In the north most aphids winter in the egg stage. From the

* Papers from the Maine Agricultural Experiment Station: Entomology No. 105.

overwintering egg a wingless female hatches in the spring and is known as the stem mother. The stem mother does not deposit eggs but produces living young, and is the first of a series of forms reproducing in the same way and designated on this account viviparous females. The young progeny of the stem mother begin at once to feed upon the sap of the plant and in about two weeks, more or less, according to the species and weather conditions, are in turn ready to produce offspring.

The first few spring generations may be wingless or at any time winged individuals or an entire winged generation may appear and fly away to fresh plants and there start new colonies where a succession of generations are produced as before. Such a flight is called the spring migration and with many species the migrants desert the host plant upon which they have been feeding and seek a plant of an entirely different species. Thus the aphid destructive to hops passes part of its life cycle upon plum trees. This alternation of hosts is a point in the life history of aphids of great economic significance, for it sometimes happens that a species can be controlled on one plant and thus its attack upon the other or alternate host be prevented.

After a species has spent all or a part of the summer upon the second host plant, winged individuals called fall migrants appear and return to the same kind of plant, the winter host, upon which the stem mother and spring generations had lived, and there continue to breed. Up to this time no males have appeared and all of the forms, whether winged or wingless, have been females giving birth to living young agamically as was the case with the stem mother.

But immediately following or soon after the fall migration there are developed the true sexes—males and egg-laying females. These oviparous females deposit one or few comparatively large eggs in which stage the insect winters and from which the stem mother hatches in the spring.

It is to such an outline as the foregoing that a species whose life history is unknown must be referred as a working basis. Any variation of the general life cycle of the aphids, however, is not a fair cause for surprise, for these insects have peculiar ways of their own which sometimes seem very erratic. For instance, besides the winter egg on the winter host some species, as the "alder blight" (*Prociphilus tessellata*) and the "woolly aphid of the apple" (*Eriosoma lanigerum*), have a second method of passing the cold season and that is as hibernating nymphs which remain in hiding at the roots or in rubbish about the base of the summer host. These hibernating nymphs come forth in the spring to feed, thus giving continued generations upon a single food plant as well as a cycle which includes a migration to an alternate host.

The characters used for descriptions and keys are many but they

center for the most part about the structures indicated in the accompanying diagram (fig. 25).

For the study of structural characters of value in determining species, reference to the following papers will prove useful (see pages 331-335), Baker (1915), (1917i), (1918a); Börner (1908); Cholodkovsky (1915); Oestlund (1919a); Patch (1909a); Pergande (1903); Swain (1919a); Tullgren (1909); van der Goot (1915); Vickery (1908); Witlaczil (1882).

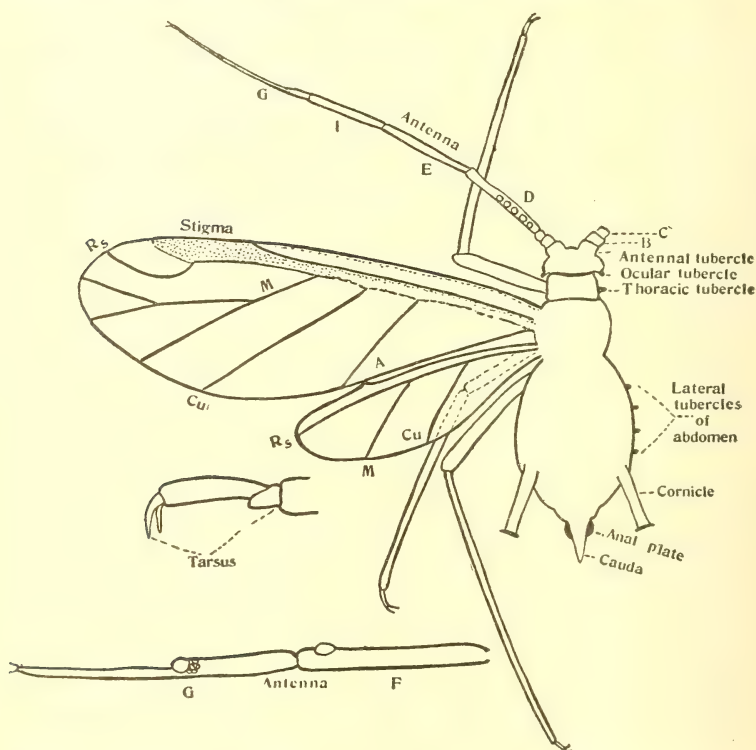


FIG. 25. Diagram of aphid, showing structures used in classification. Greatly enlarged. Drawing by Dr. Edith M. Patch.

Key to Genera.

1. Fore wings with three oblique veins; the stigmal vein (Rs) wanting; M never branched; cornicles never present; all generations

Footnote: The manuscript of this paper was first put into shape for publication in June, 1916. In January, 1920, it was revised. The three years and more during which the paper lay idle have been, systematically speaking, a period of growing pains for the aphids. The species of *Phylloxera* and *Chermes*, after tugging for many years at the apron strings

oviparous,—the parthenogenetically produced larva incompletely developed when deposited and protected by an egg membrane ...

Family PHYLLOXERIDAE or CHERMESIDAE 2

Fore wing with four oblique veins; the stigmal vein (Rs) present (except when incomplete or wanting in *Calaphis*); the second vein (M) simple or once or twice branched; the single annual gamogenetically produced generation, only, developing externally as eggs; the parthenogenetically produced larva completely developed when deposited, rarely with a pellicle from which it frees itself at once Family APHIDIDAE 3

2. Antenna of alate female with five segments. Always on conifers *Chermes*, p. 329

Antenna of alate female with three or four segments. Never on conifers *Phylloxera*, p. 330

3. Tarsi all atrophied 4

Tarsi not atrophied 5

4. Antenna with five segments *Mastopoda* APHIDINI, p. 311

Antenna with six segments [*Atarsos*] APHIDINI

5. Hind tarsus not excessive in length 6

of Aphididae Passerini, are well-nigh certainly established as an independent family though for convenience a few old-fashioned people still speak of them in subfamily terms. The genus *Aphis* has been threatened with a disaster as great as has ever befallen a zoological name but has happily been allowed to retain her association with certain of her adopted species. To be sure many of her daughters have been christened anew, a ceremony long needed and prophesied more than thirty years ago by Oestlund (1887).

There have been spasms in the present aphid upheaval which remind one of a red revolution, with each individual species not only shrieking for a generic name of her own but also the liberty of flaunting an unlimited number of trinomials by virtue of which our common and well-known pea aphid has been published fourfold as follows; *Acyrtosiphon pisi pisi*, *Acyrtosiphon pisi destructor*, *Acyrtosiphon pisi turanicum*, and *Acyrtosiphon pisi ussuriensis*.

With such extreme radicalism the writer has no personal sympathy but on the other hand most of the recent systematic work with aphids has been concerned with legitimate and logical changes resulting necessarily from intensive study with a family of insects the nomenclatural history of which is crowded with both synonyms and composite species,—a natural and healthy growth. It is therefore not in a spirit of adverse criticism that the present paper is allowed to go to press already out of date in many respects before it is published. It is rather that the writer feels that there may be a place for a connecting link between the aphid literature of yesterday and that of to-morrow.

It should be stated therefore that this paper is not prepared especially for the use of systematic aphidologists. The works recently published (or still in preparation) by Messrs. Baker, Oestlund, Swain and Wilson need no addition that the writer is equipped to make. It is rather offered, in a spirit of sincere human sympathy, to the "lay entomologist" who is experiencing a mental (and perhaps a moral) struggle in learning for example to call the insect he has long known as *Aphis avenae* Fab. by the name *Rhopalosiphum prunifoliae* Fitch.

Criticisms or suggestions or determinations by practically all the aphid workers of America should be gratefully acknowledged, though the writer should be held accountable for the keys as they stand except as follows: Dr. A. C. Baker contributed the section devoted to the Callipterini and determined the insects belonging to this tribe; Mr. Asa Maxson contributed the Pemphiginae; and Mr. H. F. Wilson prepared the Lachnid portion.

- Hind tarsus with second joint excessive in length, approximating length of hind tibia, first joint reduced (apparently lacking) ..
 [Trama] LACHNINI, p. 256
6. Stigma narrow and long. Stigma or stigmal shading extending about curve of wing nearly to distal tip of Rs 7
 Stigma not unusual in foregoing respect 8
7. M once branched. Only on conifers
 Mindarus MINDARINAE, p. 328
 M twice branched. A giant aphid, not on conifers
 Longistigma LACHNINI, p. 251
8. Stigma short and stubby. Migrating between *Cornus* and grasses
 Anoecia LACHNINI, p. 258
 Stigma and habitat not both as in foregoing 9
9. Eyes without ocular tubercles; head often elongate; feeding on sedges or grasses SALTAPHIDINA, p. 273
 Aphids not in accord with foregoing combination 10
10. Rim-like cornicle, situated on hairy, broadly cone-shaped or volcano-shaped tubercle. On conifers, except *Nippolachnus rosae* Remaining genera of LACHNINI, p. 256
 Cornicle various but not on hairy tubercle; if reduced to ring-like or if absent, then M of fore wing is twice branched (except sometimes in *Tamelia*) 11
 Cornicle vestigial (mere pores) or wanting. Fore wing with M never more than once forked 26
11. Hind wing not unusually small (except in *Rhopalosiphum serotinae*) 12
 Hind wing minute Microparsus MACROSIPHINI, p. 311
12. Media of fore wing twice forked (except sometimes in *Tamelia*) 13
 Media of fore wing once forked. Cornicle cylindrical
 Toxoptera MACROSIPHINI, p. 302
13. Antennae of alate form six-segmented 14
 Antenna of alate form five-segmented
 Siphia CHAITOPHORINA, p. 285
14. Cornicle merely ring-like, cauda knobbed or rounded, anal plate often bilobed or divided. *Monellia*, *Phyllaphis*, *Tamelia*
 CALLIPTERINI, pp. 279, 287
 Cornicle distinct, varied in size and shape 15
 Cornicle absent MONAPHIDINA, p. 273
 and FULLAWAYINA, p. 288
15. Aphids with long, straight hairs on body, legs, and antennae; cornicles large and usually vasiform. Large gregarious species on bark of *Salix* and *Populus* PTEROCOMMINA, p. 288
 Cornicle large, at least three times length of hind tarsus, swollen in middle. On *Acer* or *Platanus*
 Drepanosiphum CALLIPTERINI, p. 286
 Cornicle large, approximately twice or less the length of hind tarsus, thickly swollen at base and suddenly narrowed, rimmed at tip. The only New England species with conspicuous finger-like processes on dorsum. On *Acer* or *Aesculus*
 Drepanaphis CALLIPTERINI, p. 286
- Cornicle usually broadest at base, tapering to truncate tip, often hourglass-shaped; not cylindrical, not club-shaped, not often with definite flange at tip 16
 Cornicle short to long, tapering, cylindrical, or swollen and club-shaped. Tip of the rimmed and not the truncate type 18
16. Aphids forming thickset colonies on stem. New England species only on birch. Antennae banded and wing veins shadowed. Parthenogenetically reproducing summer generations in part apterous and in part alate .. Symydobius CALLIPTERINA, p. 280

- Body, antennae and legs with long slender lash-like hairs; cauda broad or pointed, rarely enlarged at apex; the parthenogenetically reproducing summer generations in part apterous and in part alate. Partial to *Aceraceae* and *Salicaceae* 17
- Hairs of antennae and legs stiff and very short (not lash-like); bodies of nymphs and apterous forms often conspicuously set with capitate hairs (suggesting pins in a cushion); cauda globose (knobbed) and anal plate notched or bilobed. No New England species on *Aceraceae* or *Salicaceae*
CALLIPTERINA, p. 274
17. New England species only on *Aceraceae*, producing small summer dimorphs *Periphyllus* CHAITOPHORINA, p. 283
- New England species only on *Salicaceae*, with no summer dimorphs
Chaitophorus and *Neothomasia* CHAITOPHORINA, pp. 281, 283
18. Antenna not situated on conspicuous frontal tubercle, though there is often a produced inner margin making a broad and shallow concavity at frontal margin. Cornicle without a definite distal area of imbricated or reticulated sculpturing, sometimes nearly smooth, usually fairly evenly beset with faint or definite curves with sometimes wavy and sometimes sharply serrate edges. Filament of antennal segment vi short or long 21
- Frontal tubercle distinctly swollen on inner margin, converging strongly. Filament of vi never short 20
- Frontal tubercle distinctly produced on both inner and outer margin. Frontal concavity broad and deep. Cornicle always long and often with distinct distal area of imbricated or reticulated sculpturing. Filament of vi never short 19
- Frontal tubercle short but definite on both margins in apterous female. In alate female frontal tubercle only slightly if at all evident on outer margin. Present on inner margin, wedge-shaped. Cornicle conspicuously swollen. Filament of vi never short
Amphorophora MACROSIPHINI, p. 301
- Aphids which are not in full accordance with any of the foregoing specifications
Macrosiphum illinoiense and *Aphis nerii*, pp. 308, 295
19. Cornicle cylindrical. Never with more than a slight swelling as in *liriodendri* *Macrosiphum* MACROSIPHINI, p. 304
- Cornicle conspicuously swollen
Nectarosiphon MACROSIPHINI, p. 310
20. Frontal tubercle and first antennal segment with prominent projections on the inner margin, especially conspicuous in the apterous female and larvae *Phorodon* MACROSIPHINI, p. 304
- Frontal tubercle or first antennal segment swollen to gibbous but without tooth-like projections ... *Myzus* MACROSIPHINI, p. 302
21. Cornicle swollen, long or short 22
- Cornicle straight, cylindrical or tapering 25
22. Cornicle short (not longer than in *Aphis*) 23
- Cornicle longer than in *Brevicoryne* 24
23. Cauda short and abruptly conical ... *Brevicoryne* APHIDINI, p. 298
- Cauda elongate *Hyalopterus* APHIDINI, p. 299
24. *Rhopalosiphum*, *Siphocoryne*, *Hyadaphis* and *Liosomaphis* APHIDINI, p. 299
25. Cauda broad at base, very short to moderately long, abruptly or evenly conical—without constriction near middle
Anuraphis APHIDINI, p. 298
- Cauda narrower and more elongate usually with constriction near middle *Aphis* APHIDINI, p. 293

26. Antenna of alate forms with six segments (except *Melaphis minuta*); cauda and anal plate not obvious; when sensoria are linear, the annulations do not completely encircle the segment ..
PEMPHIGINAE, p. 311
- Antenna of alate forms with three to five 27
27. Cauda and anal plate obvious; linear annulations of all antennal segments distad, the second completely encircling the segment ... 28
- Antenna with numerous subcircular prominent sensoria, five-segmented [Ford]
28. Antenna five-segmented *Hamamelistes* HORMAPHIDINAE, p. 328
- Antennae three-segmented *Hormaphis* HORMAPHIDINAE, p. 328

Tribe LACHNINI.

BY HARLEY FROST WILSON, M.S.

Probably because the species of this group live mostly on conifers and forest trees or shrubs, they have not been collected to any great extent and only a few species have actually been collected in Connecticut. However, all of the species given here have been taken in adjoining states and therefore must occur in this state as they range from Maine southward as far as Virginia and westward to Minnesota.

Some of the specific names given have not heretofore been used for American species but the writer has been working on a monograph of this group for several years and has found that a number of our American forms are but synonyms of European species.

Key to Genera.

1. Tarsi of hind legs with both segments distinct 2
- Tarsi of hind legs apparently with but one segment or the first minute or wanting [Trama]
2. Stigmal vein arising from the body of the stigma and back of the stigmal point,* which is tapering (on deciduous trees or shrubs) 3
- Stigmal vein arising from the base of the stigmal point which is always truncate. (On conifers) 6
3. Stigma long and slender, sides parallel or nearly so 4
- Stigma stout and comparatively short, outer or inner edge rounded, the opposite side nearly straight 5
4. Stigma long and slender and curving round the point of the wing and stigmal point extending far beyond the base of the radius ..
Longistigma, p. 257
- Stigma long and slender, not extending around the point of the wing; stigmal point extending but a short distance past the base of the radius Tuberolachnus, p. 257
5. Stigma with the outer edge rounded and the inner edge straight to the base of stigmal point. Median vein with two forks
Nippolachnus, p. 258
- Stigma with the inner edge rounded and the outer edge straight, median vein once forked Anoecia, p. 258
6. Rostrum with the last three segments forming a long slender spear-shaped point (always bark feeders) 7
- Rostrum with the last segment short and blunt, the third and fourth segments quadrate 8

* The stigmal point as here defined is the tapering point set off by a line extending from the inner edge to the outer edge of the stigma.

7. Wings with median vein normally two-branched *Dilachnus*, p. 260
Wings with median vein once branched *Lachniella*, p. 268
8. Needle-feeding species having the body covered with white flocculence. Hairs on body and legs fine setaceous 9
Needle-feeding species not covered with white flocculence. Hairs on body strongly spine-like 10
9. Median vein of front wing with a single fork .. *Schizolachnus*, p. 269
Median vein of front wing simple *Unilachnus*, p. 269
10. Antennae with six segments *Eulachnus*, p. 270
Antennae with five segments *Essigella*, p. 271

Longistigma Wilson.

L. caryae (Harris). *Lachnus caryae* Harris. *L. longistigma* Monell. (Pl. vii, 1.)

Ins. Inj. Veg., 190, 1841.

This large and interesting species does not require a detailed description for its identification as the peculiar long, slender stigma is sufficient to separate it from all other known species. The body is covered with bluish white pruinose and the dorsum of both apterous and alate forms have a regular pattern of black markings. It is a bark feeder.

Apterous viviparous female: General color ash-gray with two triangular black spots on the pronotum and one quadrangular spot on the mesonotum. Abdomen with two rows of rather large black spots down the center of the abdomen, a row of smaller black spots outside of these and another row of larger spots along each side of the abdomen. Legs reddish brown with black joints. Length of body about six millimeters.

Alate viviparous female: General color ash-gray, the head and thorax dull black. Abdomen as in the apterous forms. The stigma is long and slender and is drawn out into a long and slender curving point which extends partly around the end of the wing.

Food Plants: *Acer saccharinum*, *Carya alba*, *C. cordiformis*, *C. glabra*, *Juglans nigra*, *Platanus occidentalis*, *Populus* sp., *Quercus marilandica*, *Tilia americana*, *T. cordata*.

On pin oak, Hartford, 19 Oct., 1909 (G. H. H.); on linden, New Canaan, 21 Sept., 1909 (A. I. B.); oak, Bridgeport, 8 Sept., 1910; pin oak, Ridgefield, 29 Aug., 1912 (J. Ballantyne); chestnut, Hamden, 21 Oct., 1910 (E. M. Stoddard); oak, Thompson, 16 June, 1914 (R. Barton); 16 Aug., 1918 (W. E. B.); New Haven, 19 June, 1910 (A. B. C.); elm, Wallingford, 19 Oct., 1915 (Alfred Curtiss).

Tuberolachnus Mordwilko.

T. punctatus (Burmeister).*

Handb. der Ent., ii, 93, 1835.

Because of its size and the prominent tubercle on the dorsum a general description of this species is sufficient to place it with ease.

* This is the species known in Europe as *Lachnus viminalis* and in America as *L. dentatus*.

The writer is preparing a monograph of this group which is nearly ready for publication which will explain the use of this name.

Description: General color ash-gray, the base color being grayish brown with a covering of white pruinose, more or less broken by the black dorsal tubercle, the black cornicles and a series of black spots on the abdomen. The under side of the abdomen is greenish brown. The two basal segments of the antennae are black, third and fourth dusky yellow and the fifth and sixth dusky to black.

The abdomen is marked with a distinct pattern of black spots and two dots on each segment forming two longitudinal rows of black spots on each side of the dorsum and two rows of black dots along the median line. The two black dots of the fourth abdominal segment are obscured by the black tubercle which occurs at that point.

The wings of the alate forms are brownish with a long slender stigma. Antennae with large circular sensoria, somewhat raised. Abdomen with a series of short tubercles along each side, antennae, legs and body with numerous short hairs. Length of body about five millimeters.

Food plants: *Salix* spp.

Nippolachnus Matsumura.

N. rosae (Cholodkovsky). *Lachnus rosae* Cholodkovsky. (Fig. 28, 2.)

Zool. Anz., xxii, 471, 1899.

I have placed this species in the above genus because it resembles very much Matsumura's figures of *N. piri* and it is undesirable to erect a new genus for it if one already exists.

The species is so distinct from all others that a detailed description is unnecessary. Both the alate and apterous forms have numerous large quadrangular sensoria on the antennae and the stigma is rounded at the apex instead of truncated. The sexual forms are both apterous. The general color is chocolate-brown without special markings. They are found on the stems of native species of roses from Maine to Colorado. The apterous forms are ovoid and about 3 mm. long. The alate forms are about 2.5 mm. long.

Food plants: *Rosa* sp.

Anoecia Koch.

Key to Species.

Antennae with transverse or quadrangular sensoria**corni**
Antennae with round or oval sensoria**querci**

A. corni (Fabricius). *Aphis corni* Fabricius. (Fig. 28, 3; Fig. 31, 15.)

Syst. Ent., 736, 1775.

This species is easily recognized by the wing venation and the sensoria on the antennal segments. The principal color marking is a large quadrangular black spot on the dorsum of the abdomen of the alate form. The antennae reach to the base of the thorax. The third segment bears from twelve to fifteen large transverse sensoria which are prominent and raised, fourth segment with three to five and fifth with one to four sensoria; sixth with one or two small sensoria near the base and a large one at the base of the finger-like unguis. Wings with the median vein having but one fork. Stigma short, stout, curved on the sides, and pointed at the ends. The winter is passed in the egg stage on *Cornus* spp. The summer stages occur on the roots of various grasses and weeds.

On *Cornus paniculata*.

New Haven, 22 Oct., 1915 (B. H. W.).

A. querci (Fitch). *Schizoneura querci* Fitch.

Nox. and Ben. Ins. N. Y., 5, 804, 1859.

This species so closely resembles *Anoecia corni* that it has for years been considered by American writers as the same. There are, however, a number of distinct differences. The two species are found on *Cornus* in the spring and fall and live on grass roots during the summer months.

Querci differs from *corni* by having oval or circular sensoria and generally shorter antennae.

Spring migrant (from *Cornus*): General color of head and thorax black; eyes deep reddish brown. Antennae dusky to black. Abdomen greenish with a pink or brownish tinge. A row of black patches along either side of the abdomen. The wing veins are solid and the median vein has a single fork. The stigma is short with the lower edge rounding to the apex like the blade of a blunt knife.

Alate viviparous female: (Summer form) General color yellowish green, antennae, thorax and legs dusky to black. Abdomen yellowish, with fine dorsal stripes and a row of six black spots along each side. Antennae with six segments reaching to the hind coxae; the sixth with a short thumb-like spur. Third segment with three or four widely separated round sensoria. Fourth and fifth with one sensorium each, near the distal end. Cornicles small and cone-shaped. Cauda broadly rounded and short. Antennae, legs and body with numerous short hairs, some of which are curved as in the apterous form.

Measurements: Length of body, 1.66 mm. Length of antennal segments, iii, 0.18 mm.; iv, 0.065 mm.; v, 0.09 mm.; vi, 0.078 and 0.03 mm. Rostrum as in the apterous form. Length of hind tibia, 0.82 mm.

Fall migrant: General color nearly the same as for the spring migrants except that in some specimens sent me by Professor Gillette a broad quadrangular band is present on the abdomen. This spot is not as black as the one on *Anoecia corni*.

The sexes are apterous and much smaller than the other forms. A complete description of this species is given by Baker (1916h).

Food plants: The early spring and late fall forms are found on *Cornus* spp. The summer forms on the roots of various grasses and weeds.

Dilachnus Baker.

Key to Species.

1. Hairs on hind tibiae long and erect 2
Hairs on hind tibiae reclinate or if erect, erect along the base of the tibiae only 4
2. Hairs on hind tibiae not numerous and heavy spine-like. (On pines) 3
Hairs on hind tibiae numerous and setaceous not heavy, spine-like. (On spruce.) **pinicola**
3. Base of angle formed by branch one and two of the median vein extending well beyond the base of the radial sector **pini**
Base of angle formed by branch one and two of the median vein not extending beyond the radial sector **inoptis**
4. Hairs on hind tibiae short and erect along the base and reclinate toward the tip of the tibiae 5
Hairs on hind tibiae entirely reclinate 6
5. Hairs on tibiae long and slightly inclined to be reclining at the base of the tibiae **atlantica**
Hairs on tibiae short and decidedly erect along the base of the tibiae **gracilis**
6. Hairs on hind tibiae distinctly spine-like and straight not abundant 7
Hairs on hind tibiae strongly reclinate, setaceous and with a drooping appearance. Usually very abundant, giving the tibiae a feathery or plumose appearance 8
7. Sixth antennal segment long and slender, spines on tibiae long and strongly spine-like **pergandii**
Sixth antennal segment short and stout, spines on tibiae short and spine-like **laricis**
8. Hairs strongly reclinate, drooping, quite long 9
Hairs strongly reclinate, drooping, very short **curvipes**
9. Sixth antennal segment long and slender **strobi**
Sixth antennal segment short and stout **pinivora**

D. inoptis (Wilson). *Lachniella inoptis* Wilson.

Can. Ent., li, 18, 1919.

Apterous viviparous female: Antennae light at the base and dusky at the tip. Femora of all legs dark, front tibiae entirely black. Tibiae on middle and hind pair of legs light colored at the base and black over the distal two-thirds. Antennae long and slender, the sixth segment finger-like and slightly shorter than the fourth. Third segment approximately equal to the fourth and fifth together; fifth considerably larger than the fourth. Third and fourth segments without sensoria, fifth with one large sensorium at the distal end. Cornicles with a large acutely sloping base. Cauda angular, anal plate slightly dished. Hairs on antennae, legs and body distinctly spine-like and long.

Measurements: Length of body 3.25 mm. Length of antennal segments, iii, 0.64 mm.; iv, 0.31 mm.; v, 0.37 mm.; vi, 0.22 mm. Total length, 1.76 mm. Rostrum, iii, 0.25 mm.; iv, 0.25 mm.; v, 0.12 mm. Total length 2.08 mm. Length of hind tibia, 2.39 mm.; hind tarsus 0.25 and 0.37 mm.

Alate viviparous female: Antennae light-colored throughout the third segment except a small part at the distal end, fourth and fifth segments light dusky at the base, darker at the tip, sixth segment entirely dusky. Femora dark except at the base, tibiae dark at the knees and along the distal one-third, the basal two-thirds light-colored. Third antennal segment with a single sensorium near the distal end, fourth segment with none, fifth segment of one antenna with one large sensorium at the distal end, the other one with an additional smaller one at the center. The beak extends slightly beyond the hind pair of coxae. Cornicles large and volcano-shaped. Wing venation typical for the genus. Hairs upstanding and long and thick, distinctly spine-like.

Measurements: Length of body, 3.25 mm. Length of antennal segments, iii, 0.64 mm.; iv, 0.31 mm.; v, 0.35 mm.; vi, 0.23 mm. Total length 1.7+ mm.? Rostrum, iii, 0.27 mm.; iv, 0.23 mm.; v, 0.1 mm. Total length 2 mm. Length of hind tibia, 2.4 mm.; hind tarsus, 0.25 and 0.37 mm.

Food plant: *Pinus inops*.

D. pini (Linnaeus). *Aphis pini* Linnaeus.

Syst. Nat., Edn. 10, 453, 1758.

Apterous viviparous female: Antennae with third segment, base of fourth, and fifth, light-colored, other parts dusky. Femora on all legs dusky, knees black. Tibiae yellowish near the base but black at distal end. Yellowish areas on front tibiae cover about one-half of segment, on middle and rear legs cover about three-fourths of the segment. Third antennal segment approximately equal in length to the fourth and fifth together. Fourth segment much shorter than the fifth but slightly longer than the sixth. Third and fourth segments without sensoria; fifth with a small sensorium near the center and a larger one at the distal end.

Measurements: Length of body 4 mm. Length of antennal segments, iii, 0.72 mm.; iv, 0.31 mm.; v, 0.41 mm.; vi, 0.27 mm. Total length 1.9 mm. Rostrum iii, 0.41 mm.; iv, 0.25 mm.; v, 0.12 mm. Total length, 2.02 mm. Length of hind tibiae, 2 mm.; hind tarsus 0.23 mm. and 0.37 mm.

Cauda broadly rounded. Body covered with small irregular black spots; a single hair arises from each one of these. Cornicles volcano-shaped. Body, legs and antennae with long spine-like hairs.

Alate viviparous female: Antennae with third segment at the base and dusky at the tip; remaining segments dusky. Femora

dusky except at the base; frontal tibiae almost entirely black, middle and hind tibiae about one-third yellowish. Antennae long and slender, third segment approximately equal in length to the fourth and fifth. Fourth segment slightly longer than the sixth, but shorter than the fifth. Third antennal segment with seven medium-sized sensoria. Fourth segment with two small sensoria, one near the middle and the other at the distal end; fifth with two, as in the fourth segment but the distal one is extremely large. Cornicles volcano-shaped. Rostrum extending to the cornicles.

Measurements: Length of body 3.9 mm. Length of antennal segments, iii, 0.70 mm.; iv, 0.3 mm.; v, 0.4 mm.; vi, 0.27 mm. Total length 1.97 mm. Length of hind tibiae, 1.7 mm.; hind tarsus 0.23 mm. and 0.37 mm.

Food plant: *Pinus sylvestris*.

D. pinicola (Kaltenbach). *Lachnus pinicola* Kaltenbach.
Lachnus abietis Fitch.

Mon. der Pflanz., 154, 1843.

Apterous viviparous female: General color, light cinnamon-brown. Abdomen with four longitudinal rows of small black spots. The abdomen covered with a light coating of white wax. The waxy coating is more abundant in the younger stages. Legs and antennae dusky to black, and with the third segment longer than the fourth and fifth together. Third and fourth and fifth antennal segments with a single round sensorium at the distal end of each. Sixth antennal segment long and finger-like. Hairs on body long and fine. Those on all of the legs are distinctly upright. Cauda broad and somewhat flattened at the end. Hind tibiae short but the tarsi long and strongly curved.

Measurements: Length of body 2.75 mm. Length of antennal segments, iii, 0.37 mm.; iv, 0.12 mm.; v, 0.166 mm.; vi, 0.187 mm. Total length 1.04 mm. Rostrum, iii, 0.187 mm.; iv, 0.187 mm.; v, 0.1 mm. Total length, 1.34 mm. Length of hind tibiae, 1.4 mm.; hind tarsus, 0.083 and 0.35 mm.

Alate viviparous female: General color of head and thorax dull blackish brown, abdomen light cinnamon-brown. Sides of abdomen pruinose; dorsum of some specimens covered with a fluffy coating of wax. Other specimens with a ridge of waxy threads along the center of the back between the wings. In these specimens the wings have probably rubbed the wax threads away. Antennae and legs cinnamon-brown except the tarsi which are black. Antennae rather slender, the third segment slightly longer than the fourth and fifth together. Fourth and sixth segments approximately equal in length. The third segment has from two to four or more small round sensoria; the fourth one or two; and the fifth two; sixth segment long and finger-like. Rostrum reaching barely beyond the hind pair of coxae. Wings with the angle formed by m^1 and m^2 extending beyond the base of the

radial sector. Cornicles medium small and light brown in color. Cauda broadly rounded. Antennae slightly hairy, body and legs with numerous long upright hairs of fine texture. Hind tibiae moderately long but the tarsi quite long in proportion.

Measurements: Length of body, 3.2 mm. Length of antennal segments, iii, 0.5 mm.; iv, 0.187 mm.; v, 0.23 mm.; vi, 0.21 mm. Total length, 1.1 mm. Rostrum, iii, 0.21 mm.; iv, 0.21 mm.; v, 0.1 mm. Total length, 1.5 mm. Length of hind tibia, 1.94 mm.; hind tarsus, 0.1 and 0.5 mm.

Food plant: *Picea* spp.

New Haven, 14 May, 1909 (E. F. Coe).

D. gracilis (Wilson). *Lachniella gracilis* Wilson.

Can. Ent., li, 20, 1919.

Apterous viviparous female: Antennae light at the base and shading to dusky at the tip. Front and middle pair of legs light-colored except at the joints, third pair black except a small area just beyond the base. Cauda dusky to black. Third antennal segment approximately equal to the length of the fourth, fifth and sixth segments together. Fourth and fifth segments approximately equal in length and the sixth shorter than the fourth. Third segment without sensoria although a single small one was observed on other specimens, fourth segment with one or two sensoria and the fifth with two. Cornicles cone-shaped, and unusually large. Cauda rather more angular than rounded but with a widely rounded tip. Hairs short and much more inconspicuous at the base of the tibia than at the tip. Hairs at the base distinctly upstanding, those toward the distal end semi-erect.

Measurements: Length of body, 3.25 mm. Length of antennal segments, iii, 0.46 mm.; iv, 0.21 mm.; v, 0.21 mm.; vi, 0.145 mm. Total length, 1.22 mm. Rostrum, iii, 0.25 mm.; iv, 0.187 mm.; v, 0.063 mm. Total length, 1.86 mm. Length of hind tibiae, 2.45 mm. Length of hind tarsus, 0.31 mm.

Alate viviparous female: Antennae light at the base of the third segment but dusky at the tip and shading into color of other segments, the last one being nearly black. First and second pair of legs dark to black except the greater portion of the tibiae. Hind legs almost black throughout except a small dusky area near the base. Antennal segments as in the apterous forms except that the fifth segment is longer than the fourth. Third segment with six, the fourth with two or three and the fifth with two large sensoria. The cornicles are unusually large as in the apterous forms and are volcano-like in shape rather than cone-shaped. The legs and antennae are quite hairy and those on the base of the tibiae are upstanding while those farther outward are reclinate. Cauda angular but broadly rounded at the tip.

Measurements: Length of body, 3.88 mm. Length of antennal segments, iii, 0.52 mm.; iv, 0.187 mm.; v, 0.23 mm.; vi, 0.166 mm.

Total length, 1.2 mm. Rostrum, iii, 0.21 mm.; iv, 0.175 mm.; v, 0.063 mm. Total length, 1.9 mm. Length of hind tibiae, 2.42 mm.; hind tarsus, 0.31 mm.

Food plant: *Pinus* spp.

D. atlanticus (Wilson). *Lachniella atlantica* Wilson.

Can. Ent., li, 21, 1919.

Apterous viviparous female: Antennae light at base of third segment, remaining parts dusky black. All three pairs of legs black except the base of the femora and a yellow area toward the base of each tibia. Third antennal segment approximately equal in length to the fourth and fifth together. Fourth segment slightly shorter than the fifth and the sixth shorter than the fourth. Third segment with a single sensorium, fourth with one and fifth with two. Beak extending to the tip of the abdomen. Cornicles extremely large, volcano-shaped.

Measurements: Length of body, 2.37 mm. Length of antennal segments, iii, 0.44 mm.; iv, 0.21 mm.; v, 0.23 mm.; vi, 0.166 mm. Total length, 1.25 mm. Rostrum, iii, 0.21 mm.; iv, 0.187 mm.; v, 0.063 mm. Total length, 2.04 mm. Length of hind tibia, 2.20 mm. Hind tarsus, 0.31 mm.

Alate viviparous female: Color of antennae and legs as in the apterous form. Third antennal segment approximately equal in length to fourth. Third segment with six to eight large circular sensoria, fourth with two and fifth with two. Cornicles extremely large. Beak extending to the base of the cornicles. Hairs on legs, body and antennae fairly abundant and longer than those of other species in this group. Those on the femora and at the base of the tibiae are not quite as upstanding as with other species in this group.

Measurements: Length of body, 2.39 mm. Length of antennal segments, iii, 0.46 mm.; iv, 0.21 mm.; v, 0.23 mm.; vi, 0.145 mm. Total length, 1.28 mm. Rostrum, iii, 0.21 mm.; iv, 0.187 mm.; v, 0.063 mm. Total length, 2 mm. Length of hind tibiae, 2.08 mm. Hind tarsus, 0.33 mm.

Food plants: *Pinus* spp.

D. pergandei (Wilson). *Lachniella pergandei* Wilson.

Can. Ent., li, 46, 1919.

Apterous viviparous female: The prominent character of this species is the deep brown to almost jet black tibiae set with heavy reclinate spines.

Antennae medium slender and extending to the second pair of coxae. All segments light-colored at the base, dusky toward the tip. Sixth segment finger-like and approximately as long as the fourth. Fifth segment with three small sensoria toward the distal end. Beak short, reaching to the base of the third pair of coxae. Tip dusky black.

Cornicles conical and with a widely sloping base. Cauda

bluntly angled and short. Abdomen covered with irregular black spots, a hair arising from each one; outside these are found other hairs or bristles. The purpose of these spots has not been determined, the entire body being set with numerous long and spine-like hairs.

The femora are brown in color and the spines which are not as coarse as those on the tibiae stand more nearly upright. The tibial spines are set in a reclinate position pointing toward the tarsi.

Measurements: Length of body, 4.16 mm. Antennal segments, iii, 0.52 mm.; iv, 0.29 mm.; v, 0.31 mm.; vi, 0.25 mm. Total length, 1.52 mm. Length of rostrum, 1.5 mm. Hind tibiae, 2.39 mm.

Alate viviparous female: Antennae dusky toward the tip, lighter at the base of the fourth segment and only the distal one-quarter of the third segment dusky. Legs with femora brown, tibiae black. Beak black at the tip and extending slightly beyond the third pair of coxae. Antennae medium slender and reaching to the hind coxae. Segment four and five approximately equal. Fifth segment about three-fifths as long as the third and much longer than the fourth or sixth. Third segment with six or eight round sensoria along the distal two-thirds. Fourth segment with two or three sensoria on the distal half. Cornicles as in apterous forms. Abdomen with numerous dusky spots each of which bears a spine-like hair as in the apterous form. Additional spines occur outside these areas.

Entire body, legs and antennae with numerous hairs.

Measurements: Length of body, 4.08 mm. Antennal segments, iii, 0.56 mm.; iv, 0.27 mm.; v, 0.29 mm.; vi, 0.25 mm. Total length, 1.55 mm. Length of hind tibiae, 2.33 mm.

Food plants: *Pinus* sp.

D. laricis (Walker). *Lachnus laricis* Walker.

Ann. Mag. Nat. Hist., Ser. 2, ii, 102, 1848.

Apterous viviparous female: General color dark brown to black, with a covering of white pruinose and with a light streak down the center of the dorsum. The antennae are dusky yellow at the base and black toward the tip. The legs are black except the basal portions of the femora and the middle of the tibiae which are dusky yellow. Cauda black, after mounting in balsam numerous brown spots may be seen on the abdomen. Antennae reaching to the base of the middle coxae. Rostrum reaching to the hind coxae. Third antennal segment nearly as long as the fourth, fifth and sixth segments together. The third and fourth segments with a single sensoria at the distal end and the fifth with two. Cornicles large and volcano-shaped. The edge of the base more or less broken.

Measurements: Length of body, 4 mm.; width, 2.2 mm. Length of antennal segments, iii, 0.73 mm.; iv, 0.27 mm.; v,

0.31 mm.; vi, 0.154 mm. Total length, 1.7 mm. Rostrum, iii, 0.27 mm.; iv, 0.19 mm.; v, 0.1 mm. Total length, 2 mm. Length of hind tibia, 2.5 mm.; hind tarsus, 0.14 and 0.4 mm.

Alate viviparous female: General color, head and thorax shining black, abdomen as in the apterous forms. Cornicles black, with a large white spot at the base, and which does not become conspicuous until the specimens are placed in alcohol. Abdomen maculated with brown.

Antennae reaching to the base of the wings and the third segment with from eight to eleven irregular sensoria; fourth segment with one or two large ones near the distal end; sixth antennal segment short and thumb-like. Antennae legs and body of both apterous and alate forms with short spine-like hairs. Those on the legs are distinctly pointed toward the tip of the segments.

Measurements: Length of body, 4.58 mm. Length of antennal segments, iii, 0.69 mm.; iv, 0.27 mm.; v, 0.35 mm.; vi, 0.135 mm. Total length, 1.5 mm. Rostrum, iii, 0.27 mm.; iv, 0.20 mm.; v, 0.1 mm. Total length, 1.9 mm. Length of hind tibia, 3.22 mm.; tarsus, 0.135 mm. and 0.35 mm.

Food plant: *Larix laricina*.

D. strobi (Fitch). *Lachnus strobi* Fitch. (Eggs, Pl. xix, 10.)

Homop. N. Y. St. Cab., 69, 1851.

Apterous viviparous female: General color shining metallic black with a series of white pruinose spots on the dorsum. The typical specimens have a median dorsal line along the abdomen extending from the prothorax to the cauda. Usually there are two white spots on the thorax, and four on the abdomen, one in front and one behind each cornicle. The legs are black and strongly curved. The cornicles are jet black. Antennae with the third, fourth and fifth segments light colored at the base and black at the tips; the sixth segment black.

Antennae long and slender, the sixth segment long and finger-like. Third antennal segment much longer than the fourth and fifth segments together; fourth and fifth segments without sensoria and the fifth with two. Rostrum extending slightly beyond the hind coxae, cornicles with a wide sloping base. Cauda broadly acute with a rounded tip. Antennae body and legs with long drooping hairs.

Measurements: Length of body, 3 to 5 mm. Length of antennal segments, iii, 0.4 mm.; iv, 0.15 mm.; v, 0.2 mm.; vi, 0.18 mm. Total length, 1.09 mm. Rostrum, iii, 0.21 mm.; iv, 0.187 mm.; v, 0.063 mm. Total length, 1.9 mm. Length of hind tibia, 2.7 mm.; hind tarsus, 0.12 and 0.29 mm.

Alate viviparous female: General color, black, sometimes tinged with brown. It is conspicuous because of the white line down the center of the body and the white spots on the abdomen similar to the apterous form. The antennae are long and slender with the

sixth antennal segment long and finger-like. Third antennal segment with ten to twelve irregular round sensoria; the fourth with two or three and the fifth with two. Rostrum reaching to the cornicles with broad sloping sides. Cauda broadly angular. Antennae, body and legs with long drooping hairs.

Measurements: Length of body, 3 mm. Length of antennal segments, iii, 0.45 mm.; iv, 0.17 mm.; v, 0.22 mm.; vi, .18 mm. Total length, 1.36 mm. Rostrum, iii, 0.21 mm.; iv, 0.187 mm.; v, 0.063 mm. Total length, 1.97 mm. Length of hind tibia, 2.70 mm.; hind tarsus, 0.1 and 0.27 mm.

Food plant: *Pinus strobus*.

Springdale, 5 Sept., 1903; Waterbury, 1 April 1904, eggs; West Goshen, 15 Oct., 1909 (S. N. Spring); New Haven, 10 Nov., 1910; Middletown, 22 June, 1911; Portland, 5 June, 1914; Hartford, 23 July, 1915 (M. P. Z.).

D. pinivora (Wilson). *Lachniella pinivora* Wilson.

Can. Ent., li, 44, 1919.

Alate viviparous female: Antennae light-colored at the base of the third, fourth and fifth antennal segments, distal portion of these segments and the sixth dusky. First and second pairs of legs yellowish at the base of the femora and along the middle of the tibiae. Other parts and tarsi deep dusky brown. Hind femora yellow at the base and dark brown at the joint, hind tibiae with yellow area clear and covering about one-third of the segment. Cornicles large and volcano-shaped. Cauda and anal plate both broadly rounded. Third antennal segment with seven medium-sized sensoria widely set apart, fourth with one or two and fifth with two. Third segment shorter than the last three together, five distinctly longer than four, and six four-fifths as long as four. Beak short, extending to the farther edge of the middle coxae. Hairs long and drooping but not so much as in *L. strobi*.

Measurements: Length of body, 2.9 mm. Length of antennal segments, iii, 0.55 mm.; iv, 0.22 mm.; v, 0.24 mm.; vi, 0.164 mm. Rostrum, iii, 0.172 mm.; iv, 0.15 mm.; vi, 0.63 mm. Total length, 1.25 mm. Length of hind tibia, 2.29 mm. Hind tarsus, 0.27 mm.

Food plant: *Pinus* spp.

D. curvipes (Patch). *Lachnus curvipes* Patch.

Me. Agr. Expt. Sta., Bull. 202, 161, 1912.

Apterous viviparous female: Antennae long and slender. Third segment approximately equal in length to the fourth, fifth and sixth. Fourth segment shorter than the fifth and longer than the sixth. Third segment with one or two sensoria near the distal end. The fourth with a single small one at the distal end and the fifth with one small and one large one. Tarsi and tip of tibiae black. Hind tibiae deep dusky black except at the base and very strongly curved. Rostrum slender and reaching to the base of the cornicles. Cornicles with a wide cone-shaped base. Cauda bluntly pointed. Antennae, legs, and body with short, more or less drooping hairs.

Measurements: Length of body, 4 to 5 mm. Width of abdomen about 3 mm. Length of antennal segments, iii, 0.9 mm.; iv, 0.27 mm.; v, 0.35 mm.; vi, 0.23 mm. Total length, 2.02 mm. Rostrum, iii, 0.27 mm.; iv, 0.25 mm.; v, 0.083 mm. Total length, 2.49 mm. Length of hind tibia, 4 mm.; hind tarsus, 0.166 mm. and 0.35 mm.

Alate viviparous female: General color in balsam deep brown. Antennae and legs dark brown, with the tarsi tips of the tibiae and distal three-fourths of hind tibiae deep dusky brown. Antennae long and slender; the third segment has ten to twelve round sensoria which vary more or less in size. The fourth segment has two or three sensoria and the fifth one small and one large one near the distal end. Rostrum long and slender reaching nearly to the tip of the abdomen. Wings long and broad with the angle formed by $m'm^2$ extending well beyond the base of the radial sector. Hind tibiae long and slender and slightly curved but not so much so as in the apterous forms. Cauda bluntly angular. Antennae, body and legs with short stout spines.

Measurements: Length of body, 4 mm. Length of antennal segments, iii, 0.97 mm.; iv, 0.37 mm.; v, 0.47 mm.; vi, 0.26 mm. Total length, 2.14 mm. Rostrum, iii, 0.31 mm.; iv, 0.25 mm.; v, 0.083 mm. Total length, 3.33 mm. Length of hind tibiae, 3.54 mm.; hind tarsi, 0.145 mm.; 0.41 mm.

Food plant: *Abies balsamea*.

Lachniella Del Guercio.

L. juniperivora Wilson.

Ent. News, xxx, 6, 1919.

Alate viviparous female: Specimens in balsam show no distinct coloration of antennae and legs, these parts appearing to be light dusky throughout. Third antennal segment approximately equal in length to the fourth and fifth segments, fourth segment shorter than the fifth, fifth and sixth about equal. Third segment with about six round sensoria of irregular size and not in alignment; fourth segment with two and fifth with two. Beak extending to the tip of the abdomen. The antennae are quite distinct from those of the other species in this genus and the cornicles are much broader at the base than those of *Schizolachnus tomentosus*. Cornicles with a wide sloping base. Cauda rounded, anal plate angular. Antennae, legs and body with a moderate number of medium hairs.

Measurements: Length of body, 1.8 mm. Length of antennal segments, iii, 0.37 mm.; iv, 0.166 mm.; v, 0.187 mm.; vi, 0.187 mm. Total length, 1.02 mm. Rostrum, iii, 0.21 mm.; iv, 0.21 mm.; v, 0.07 mm. Total length, 1.82 mm. Length of hind tibia, 1.36 mm.; hind tarsus, 0.083 mm. and 0.21 mm.

Food plant: *Juniperus virginiana*.

Schizolachnus Mordwilko.**S. pineti** (Fabricius). *Aphis pineti* Fabricius.

Spec. Ins., ii, 389, 1781.

This species is easily distinguished by the white flocculent waxy threads which cover the body. The wing venation is somewhat deceptive as the median vein is frequently simple. The sensoria are variable on the antennae of the alate forms as there are in most specimens none on the third segment. In others there may be from one to five. The location of these is quite distinctive as they are located on the basal half of the segment instead of the distal half which is the case with practically all other Lachnids.

Apterous viviparous female: General color dusky dark grayish green, covered with waxy threads which come from glands situated mostly on the dorsum of each abdominal segment. Eyes deep red almost black, basal portions of the antennae, the cornicles and the legs, except a small portion of the front and middle tibia, dusky black. The hind tibiae are jet black. The antennae are long and slender, reaching midway between the hind coxae and the cornicles. The third segment is shorter than the fourth and fifth segments together, the fourth is slightly longer than the fifth and the sixth is shorter than either of these; three and four without sensoria and five with the usual large one at the distal end. Cornicles small and irregularly cone-shaped. Cauda broadly angled.

Measurements: Length of body, 2.15 mm. Length of antennal segments, iii, 0.46 mm.; iv, 0.19 mm.; v, 0.20 mm.; vi, 0.17 mm. Total length, 1.15 mm. Rostrum, iii, 0.12 mm.; iv, 0.1 mm.; v, 0.063 mm. Total length, 8 mm. Length of hind femur, 1.05 mm.; hind tibia, 1.62 mm.; hind tarsus, 0.083 + 0.33 mm.

Alate viviparous female: General color same as apterous forms. Antennae perhaps a little more dusky. All parts of the legs are black except the middle portion of the second pair of tibiae.

Measurements: Length of body, 2.14 mm. Length of antennal segments, iii, 0.41 mm.; iv, 0.23 mm.; v, 0.23 mm.; vi, 0.187 mm. Total length, 1.25 mm. Rostrum same as in apterous form. Length of hind femur, 1.1 mm.; hind tibia, 1.78 mm.; hind tarsus, 0.083 + 0.35 mm.

Food plants: *Pinus scopulorum*, *P. radiata*.

Unilachnus Wilson.**U. parvus** (Wilson). *Lachnus parvus* Wilson.

Trans. Am. Ent. Soc., xli, 104, 1915.

Alate viviparous female: Body elongate and slender, antennae and legs medium slender and thickly covered with long slender hairs. Antennae reaching to the third pair of coxae and the rostrum reaching to the second pair; rostrum broad and blunt at

the tip. The third antennal segment bears about eight small sensoria; the fourth two and the fifth a single large one near the distal end; sixth with the usual large one near the base of the antennal spur. Wings hyaline and the median vein but a very indistinct single piece. Cornicles small and more or less bell-shaped. The opening rather large for the base. Cauda bluntly angled.

Measurements: Length of body, 1.48 mm.; width, 0.6 mm. Length of antennal segments, iii, 0.32 mm.; iv, 0.154 mm.; v, 0.176 mm.; vi, 0.154 mm. Length of wing, 2.5 mm.; length of hind tibia, 0.92 mm.; length of hind tarsus, 0.3 mm. and 0.066 mm.; length of rostrum, 0.49 mm.

Food plants: *Pinus rigida*, *P. virginiana*.

Eulachnus Del Guercio.

E. agilis (Kaltenbach). *Lachnus agilis* Kaltenbach.

Mon. der Pflanz., 161, 1843.

Apterous viviparous female: General color, orange-brown to greenish black; the color is caused to vary more or less by a grayish pulverulence covering the body. When placed in balsam, four rows of black spots are visible on the body and from each one there arises a long spine-like hair. Antennae light at the base and shading to black at the tip. Antennae long and slender and quite spiny. The third segment is not quite as long as four and five together, segments four and six approximately equal. The rostrum is short, not quite reaching the hind coxae. The cornicles are small with a narrow cone-shaped base. Entire body covered with long spine-like hairs.

Measurements: Length of body, 2.4 mm. Length of antennal segments, iii, 0.45 mm.; iv, 0.24 mm.; v, 0.31 mm.; vi, 0.24 mm. Total length, 1.4 mm. Length of hind tibia, 1.6 mm.; hind tarsi, 0.12 mm. and .22 mm.

Alate viviparous female: General color dark green or brown covered with white waxy powder or threads. When mounted in balsam the head and thorax are brownish and the abdomen greenish brown. Antennae and hind pair of legs black, the tibia of the front pair of legs light-colored except at the ends of the segment. Antennae long and slender and set with long black spine-like hairs. The third segment without sensoria, fourth and fifth with one each. Other characters as in apterous forms.

Measurements: Length of body, 2 mm. Length of antennal segments, iii, 0.44 mm.; iv, 0.25 mm.; v, 0.26 mm.; vi, 0.19 mm. Total length, 1.3 mm. Length of hind tibia, 1.6 mm. Length of hind tarsus, 0.12 mm. and .22 mm.

Food plant: *Pinus* spp.

Essigella Del Guercio.*E. pini* Wilson.

Ent. News, xxv, 1, 1919.

Apterous viviparous female: General color a light yellowish green, with a series of rows of small brown spots on the abdomen. The fore part of the body is quadrangular, while the abdomen tapers to a point. The antennae are five-segmented. The rostrum of this species and of *E. californica* are also quite distinct, the terminal segment being crescent-shaped at the tip. The cornicles are small and without the large cone-shaped base found in most species of Lachnids. Length of body, 1.5 mm.

Alate viviparous female: The antennae are five-segmented. General color yellowish green; the thorax being brownish (?). The abdomen is marked with a series of brown spots which occur in longitudinal rows. The antennae are short and have five segments; distal half of the third, and the fourth and fifth segments, brown. The fifth segment is longer than the fourth and the fourth and fifth together are slightly longer than the third; third segment with three and sometimes four roundish sensoria; fourth with one large one at the distal end, and the fifth with one large and several small ones near the tip. The head is set with coarse spines, six of which are set in front; similar spines are found on the body. The antennae have a few inconspicuous spines widely set apart. The legs are distinctly spiny but not as much so as in *Essigella californica*. The rostrum is short with the third and fourth segments quadrangular and the terminal segment half moon-shaped and not acutely pointed as in other species of *Lachninae*. Wings long and narrow, front wing usually with the median vein simple. The tibiae are short and rather stout while in *E. californica* they are longer and more slender. The cornicles are but openings with thickened edges. The cauda is angular with the tip elongated into a sharp nipple-like projection.

Measurements: Length of body, 1.55 mm. Length of antennal segments, iii, 0.21 mm.; iv, 0.1 mm.; v, 0.145 mm. Total length, 0.6 mm. Length of wing, 2.33 mm.; width, 0.9 mm. Length of beak, 0.64 mm. Length of hind tibiae, 0.85 mm.; hind tarsus, 0.1 mm. and 0.145 mm.

Food plants: *Pinus strobus*, *P. virginiana*, *P. spp.*

Subfamily APHIDINAE—Tribe CALLIPTERINI.

By ARTHUR CHALLEN BAKER, PH.D.

The tribe Callipterini is composed of forms which live upon the foliage and bark of plants. The species in many subtribes have developed peculiar habits. Some are almost solitary whereas others live in colonies. Some have developed the power of leaping

whereas others are very sedentary. The sexual forms do not vary greatly from the viviparous ones. In nearly all of the subtribes the males are winged, but in the Saltusaphidina they are apterous. In the other tribes several kinds of males may be found in the same species. Apterous males and fully winged males may be seen and various types of intermediate males also occur. The oviparous females are nearly always apterous but in the Phyllaphidina winged oviparous females are present in the genera *Tamelia* and *Neophyllaphis*. The latter genus, however, does not occur in New England.

The wing veins are not greatly reduced in any members of the tribe. Considerable variation, however, is shown in the cornicles, although they are never long and prominent as in the Aphidini. The usual form is the truncate cornicle seen in *Mysocallis*, *Chaitophorus*, etc. Very often they are sculptured. In some cases they are reduced to small cup-shaped structures and again they may be represented by mere rings.

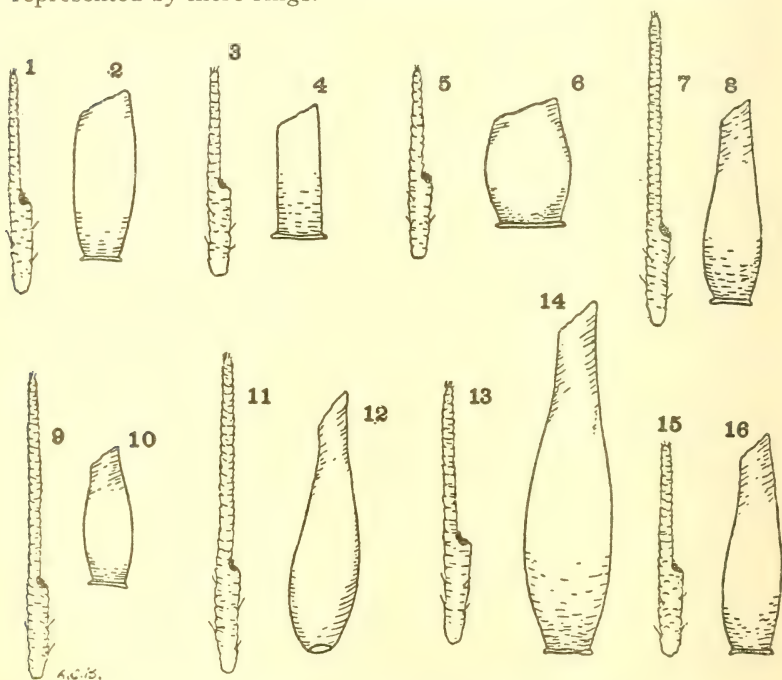


FIG. 26. Structures of aphids of the Subtribe Pterocommina. (1-2) *Melanoxanthium medium* Baker. (3-4) *Pterocomma populea* Kaltenbach. (5-6) *Melanoxanthium smithiae* Monell. (7-8) *Melanoxanthium bicolor* Oestlund. (9-10) *Melanoxanthium beulahensis* Cockerell. (11-12) *Melanoxanthium flocculosum* Weed. (13-14) *Melanoxanthium salicis* Linnaeus. (15-16) *Melanoxanthium populifoliae* Fitch. All greatly enlarged. Drawing by Dr. A. C. Baker.

The antennae are as a rule long and slender and are armed with few sensoria excepting in the males. These sensoria are usually small and subcircular or oval in shape. In rare cases they are elongate.

The cauda is generally knobbed and the anal plate bilobed. In some cases, however, both cauda and anal plate are rounded and in the Saltusaphidina the anal plate is completely divided.

Wax secretion is present to a limited extent. It is most prominent in the Phyllaphidina. Here there are large abdominal wax plates in all of the forms and the insects present a woolly-like appearance on the foliage. Wax secretion is also present in the genus *Euceraphis*, but only to a limited extent and in the Saltusaphidina it is especially prominent in some of the oviparous forms. This holds true also in the Phyllaphidina.

The habit of leaping is most prominently developed in the Saltusaphidina as the name implies. Here the muscles of the femora are greatly enlarged for this purpose. Many other members of the tribe greatly approach this condition and in this connection the genus *Monellia* may be especially mentioned. Others, although they do not distinctly leap, drop so suddenly when disturbed that they almost appear to do so. Our common *Synydobius* on the birch is very difficult to collect on account of such a habit.

Certain species are closely attended by ants in return for the honey dew excreted and some species are protected by these insects by means of sheds or roofs built over colonies on the leaves or twigs.

The relations of the different subtribes may be expressed by the accompanying diagram. (Fig. 27.)

Key to Subtribes.

- | | | |
|----|--|--------------------------------|
| 1. | Eyes of alate form with ocular tubercles present; head not elongate | 2 |
| | Eyes without ocular tubercles; head often elongate | 2 |
| | | Saltusaphidina , p. 289 |
| 2. | Antennae armed with many rather long prominent hairs | 3 |
| | Antennae with minute bristles or only a very few hairs | 5 |
| 3. | Cornicles present | 4 |
| | Cornicles absent | Fullawayina, p. 288 |
| 4. | Cornicles cylindrical or vasiform | Pterocommina, p. 288 |
| | Cornicles truncate, enlarged at base | Chaitophorina, p. 281 |
| 5. | Cornicles present, position as usual | 6 |
| | Cornicles absent above | [Monaphidina] |
| 6. | Cornicles rarely reduced to mere rings; insects not prominently woolly; never gall makers | 7 |
| | Cornicles reduced to rings; large abdominal wax plates present making the insects prominently woolly; occasionally gall makers | |
| | | Phyllaphidina , p. 287 |
| 7. | Cornicles variable, usually rather long and somewhat swollen; oviparous female with an elongate ovipositor | Drepanosiphina, p. 285 |
| | Cornicles never long, always short and truncate; oviparous female not always with an elongate ovipositor | Callipterina, p. 274 |

Subtribe CALLIPTERINA.

Cornicles present, truncate in form. Antennae with setae or spines of six segments and armed with subcircular or in a few cases somewhat elongate sensoria. Wings often clouded, mottled or banded. Cauda as a rule knobbed, anal plate usually more or less indented or bilobed. Body often armed with capitate hairs or spines.

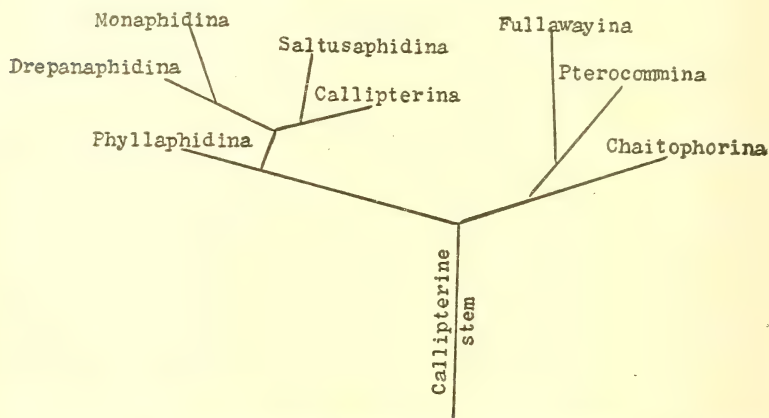


FIG. 27. Derivation of Callipterine aphids. Drawing by Dr. A. C. Baker.

Key to Genera.

1. Cauda not distinctly knobbed; anal plate entire or nearly so 2
 Cauda distinctly knobbed; anal plate bilobed or sometimes deeply divided 3
2. Antennae minutely setose, sensorium at base of unguis oval or somewhat rounded; oviparous female with secondary sensoria ..
 Symydobius, p. 280
 Antennae not minutely setose; sensorium at base of unguis long and narrow, oviparous female without secondary sensoria
 Euceraphis, p. 277
3. Anal plate bilobed, not deeply divided, cauda distinctly knobbed .. 4
 Anal plate deeply divided with a U-shaped cleft, lobes somewhat separated at base; cauda knobbed, often somewhat elongate
 Therioaphis, p. 281
4. Cornicles truncate, fairly well developed; wings not held horizontal in repose 5
 Cornicles reduced almost to mere rings; wings sometimes held horizontal in repose *Monellia*, p. 279
5. More or less distinct antennal tubercles present, oviparous female with secondary sensoria; radial sector often absent *Calaphis*, p. 275
 No distinct antennal tubercles present, oviparous female without secondary sensoria; radial sector usually present *Myzocallis*, p. 279

Calaphis Walsh.

Cornicles present, distinct, truncate; antennae of six segments armed with oval sensoria and placed on more or less distinct antennal tubercles. Fore wing with the media twice branched, the radial sector either absent or faintly indicated, sometimes, however, complete; hind wing with both media and cubitus present. Cauda distinctly knobbed, anal plate bilobed.

Forms more or less solitary upon the foliage; sexes not markedly different from the other forms; oviparous female producing several eggs and possessing sensoria upon the antennae.

Key to Species.

1. Unguis of segment vi of antenna between two and three times as long as base 2
 Unguis of segment vi four times or more as long as base 4
2. Head and thorax not striped longitudinally 3
 Head and thorax longitudinally striped with black; all wing veins heavily bordered with black or dark brown *betuella*
3. Transverse bands upon the abdomen as well as the cornicles black or dark brown; unguis of segment vi shorter than width of head across the eyes *annulata*
 Abdomen without such dark markings; cornicles yellow; unguis of segment vi longer than width of head across the eyes *betulaecolens*
4. Antennae uniform dusky or black with the exception sometimes of i and ii and the basal portion of iii 5
 Antennae alternately banded with yellow and black; media thinner than other veins of wing; unguis of segment vi about five times as long as base *castaneoides*
5. Unguis of segment vi about four times as long as base 6
 Unguis of segment vi about six times as long as base; media about the same as other veins of the wing *alni*
6. Media thinner than other veins of wing, with the radial sector faintly indicated *castaneae*
 All veins of the wing about the same and bordered with brown; radial sector totally absent *myricae* n. sp.

C. myricae Patch, n. sp.

This conspicuous aphid is very common on sweet fern (*Myrica asplenifolia*) in the vicinity of Orono, Maine, and has been held in the collection under the manuscript name of *Calaphis myrica* since 1906, when it was first taken. The body of both the apterous and alate females is green. The cornicles are black throughout or else green at the base and black at the tip.

Alate viviparous female: Relative lengths of the antennal segments iii to vi indicated by 20, 14, 12, 4 + 17. Segment iii has from about twenty to twenty-four sensoria extending in a somewhat irregular row, the basal one-sixth and the distal one-fourth of segment without sensoria. Frontal tubercle prominent, nearly as long on the inner margin as the inner margin of segment i of antenna. Veins of fore wing heavy and about uniformly shaded with dark brown. Radial sector absent. Cauda as long as

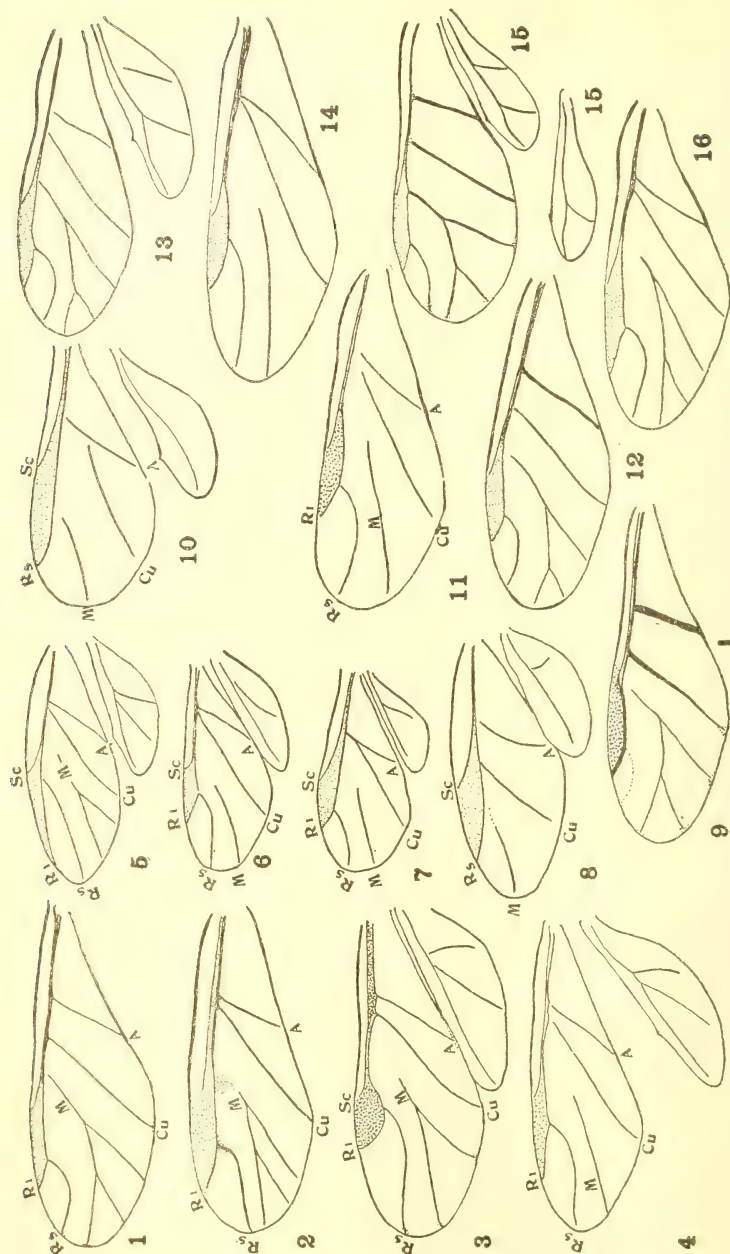


FIG. 28. Wings of aphids. (1) *Macrosiphum lilii* Monell. (2) *Nippolachnus rosae* Cholodkovsky. (3) *Anoecia corni* Fabricius. (4) *Prociphilus xylostei* DeGeer. (5) *Myndarus*. (6) *Tetraneura*. (7) *Hanamelistes*. (8) *Chermes*. (9) *Calaphis castaneae* Fitch. (10) *Phylloxera*. (11) *Thecabius patchii* Gillette. (12) *Siphocoryne xylostei* Schrank. (13) *Aphis saliceti* Kaltbach. (14) *Prociphilus imbricator* Fitch. (15) *Rhopalosiphum serotinae* Oestlund. (16) *Periphyllus* (*Chaetophorus*) *americanus* Baker. All greatly enlarged. Drawing by Dr. Edith M. Patch.

cornicle, distinctly knobbed and armed with long lash-like hairs on knobbed part. Body hairs near cauda and on front of head stiff and capitate.

The apterous viviparous female has the body armed with capitate hairs. Antennal segment iii has from fifteen to twenty circular sensoria in a row which does not cover the proximal fifth or the distal third of segment.

Described from specimens taken at Orono, Maine, 1906-1918. Cotype specimens in the U. S. Natural Museum, and at the Maine Agricultural Experiment Station.

C. alni Baker.

Proc. Ent. Soc. Wash., xviii, 188, 1916.

C. annulatus (Koch). *Chaitophorus annulatus* Koch.

Die Pflanz. Aphiden, 7, 1854.

C. castaneae (Fitch). *Callipterus castaneae* Fitch. (Fig. 28, 9.)

Nox. and Ben. Ins., 3, 471, 1856.

On chestnut, New Haven, 7 July, 1909 (A. I. B.); 20 Aug., 1912 (W. E. B.); 27 June, 1914 (M. P. Z.).

C. betulella Walsh.

Proc. Ent. Soc. Phila., i, 301, 1862.

C. castaneoides Baker.

Proc. Ent. Soc. Wash., xviii, 187, 1916.

C. betulaecolens (Fitch). *Aphis betulaecolens* Fitch.

Homop. N. Y. St. Cab., 66, 1851.

On birch, New Haven, 23 June, 1919.

Euceraphis Walker.

Cornicles present, truncate. Antennae of six segments, long and slender; armed with rather narrow sensoria usually near the base of segment iii, the unguis of segment vi usually not much longer than base, sensorium at base of unguis long and oval. More or less distinct antennal tubercles present. Fore wing with the media twice branched, hind wing with both media and cubitus present. Cauda usually knobbed and rather large, anal plate usually entire. Abdomen of the alate form often with distinct wax producing glands.

Forms very large and usually solitary in habit; sexes not very different from the other forms.

Key to Species.

1. Tibiae not uniform black and without clear pores 2
Tibiae uniform black and covered thickly with a large number of clear pores *mucida*
2. Abdomen without dark patch and clear wax pore areas 3
Abdomen with a large dark brown patch in which are clear wax pore areas *betulae*
3. Combined length of base and unguis of vi about equal to or much more than the diameter of head across the eyes 4

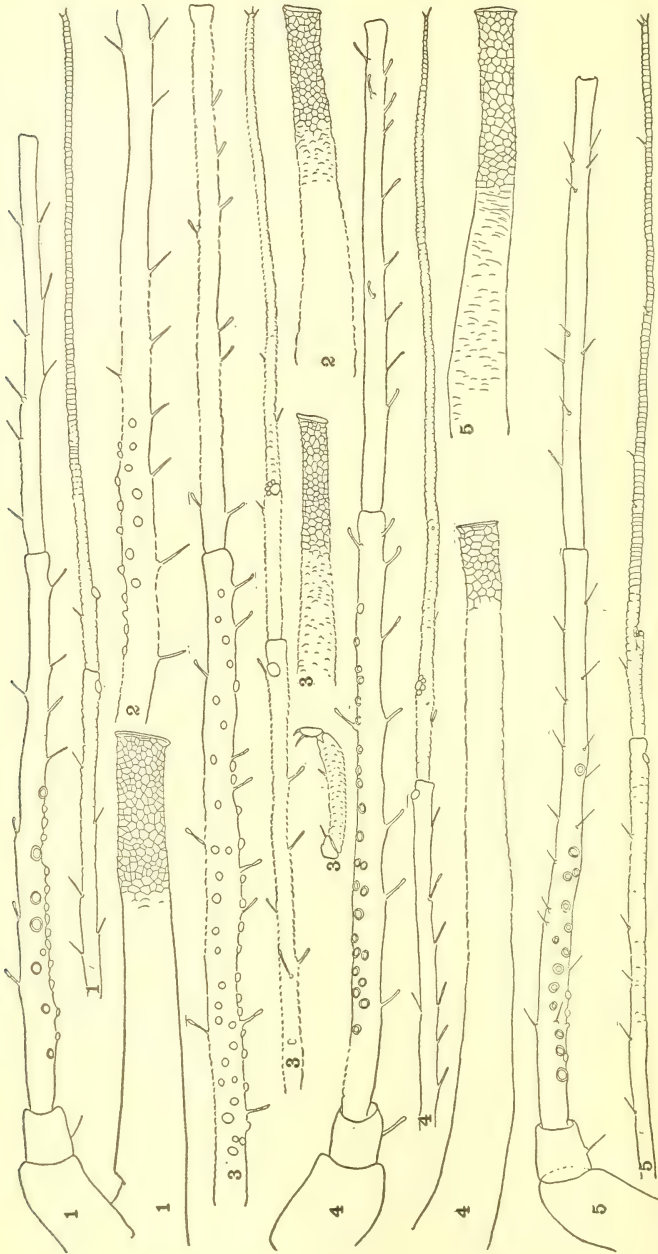


FIG. 29. Antennae, cornicles and tarsi of aphids (viviparous females). (1) *Macrosciphum sonchi* Linnaeus,—apterous. (2) *Macrosciphum tanacetii* Linnaeus,—apterous. (3) *Macrosciphum tanacetii* Linnaeus,—alate. (4) *Macrosciphum albifrons* Essig,—apterous. (5) *Macrosciphum impatienscolens* Patch,—alate. All greatly enlarged. Drawing by Dr. Edith M. Patch.

- Combined length of base and unguis of vi about equal to half of the diameter of head across the eyes **brevis**
 4. Unguis of segment vi less than one-third of the length of base **deducta**

E. betulae (Koch). *Callipterus betulae* Koch.

Die Pflanz. Aph., 217, 1855.

Hartford, 11 Sept., 1905 (C. N. Ruedlinger).

E. brevis Baker.

Jour. Econ. Ent., 10, 426, 1917.

E. deducta Baker.

Jour. Econ. Ent., 10, 429, 1917.

E. mucida (Fitch). *Callipterus mucidus* Fitch.

Nox. and Ben. Ins. N. Y., 3, 334, 1856.

On black birch, New Haven, 8 July, 1909 (A. I. B.); on *Betula populifolia*, Rainbow, 12 Oct., 1909 (W. E. B.); 20 Oct., 1909 (W. O. Filley); on black birch, New Haven, 1 July, 1913 (L. B. R.).

Monellia Oestlund.

Cornicles present as mere rings. Antennae slender, of six segments; sensoria oval or subcircular; head broad; prothorax prominently separated. Fore wing with the media twice branched; hind wing with both media and cubitus present. Wings often held flat upon the back in repose. Cauda knobbed, anal plate bilobed.

Forms living solitary upon the leaves, sometimes having the power of leaping. Apterous forms rare.

Key to Species.

1. Costal margin of wing without broad band, though in some cases with the costal vein brown 2
 Costal margin of wing with a broad brown band extending beyond the stigma **costalis**
2. Abdomen with rows of dark brown spots; unguis of segment vi of antennae longer than or about equal to base **caryae**
 Abdomen without such spots; unguis of segment vi of antennae considerably shorter than base **caryella**

M. caryae (Monell). *Callipterus caryae* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 31, 1879.

On hickory, New Haven, 30 Aug., 1912 (W. E. B.).

M. caryella (Fitch). *Aphis caryaella* Fitch.

Nox. and Ben. Ins. N. Y., i, 163, 1856.

M. costalis (Fitch). *Aphis caryaella costalis* Fitch.

Nox. and Ben. Ins. N. Y., i, 165, 1856.

On hickory leaves, New Haven, 27 June, 1910 (W. E. B.).

Myzocallis Passerini.

Cornicles truncate without usually a very distinct neck; antennae of six segments armed with a few bristles and with oval or sub-

circular sensoria. Fore wing with the media twice branched, hind wing with both media and cubitus present. Cauda knobbed, anal plate bilobed but not deeply divided, body often with stout hairs.

Key to Species.

1. Dorsum of abdomen with finger-like tubercles 2
Dorsum of abdomen without finger-like tubercles 4
2. Unguis of segment vi of antennae about equal in length to the base 3
Unguis of segment vi about twice as long as base **punctatellus**
3. Segment iii of antennae shorter than width of head across the eyes;
abdominal tubercles setose and dark brown **fumipenellus**
Segment iii of antennae longer than width of head across the eyes
..... **ulmifolii**
4. Unguis of segment vi considerably longer than base 5
Unguis of segment vi about equal to or less than length of base ..
..... **alnifoliae**
5. Wings more or less banded or mottled with dark brown 6
Wings not so banded or mottled **coryli**
6. Cornicles and a patch around their bases black **discolor**
Cornicles and a patch around their bases yellow **asclepiadis**

M. alnifoliae (Fitch). *Lachnus alnifoliae* Fitch.

Homop. N. Y. St. Cab., 67, 1851.

M. asclepiadis (Monell). *Callipterus asclepiadis* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 29, 1879.

M. coryli (Goeze). *Aphis coryli* Goeze.

Ent. Beitrage ii, 311, 1778.

M. discolor (Monell). *Callipterus discolor* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 30, 1879.

On white oak, New Haven, 25 July, 1912 (J. K. L.).

M. fumipenellus (Fitch). *Aphis fumipenella* Fitch.

Nox. and Ben. Ins. N. Y., i, 166, 1855.

M. punctatellus (Fitch). *Aphis punctatella* Fitch.

Nox. and Ben. Ins. N. Y., i, 166, 1856.

On oak, New Haven, 25 July, 1912 (J. K. L.); New Haven, 27 June, 1913 (H. L. Trowbridge).

M. ulmifolii (Monell). *Callipterus ulmifolii* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 29, 1879.

On elm, New Haven, 13 July, 1909 (A. I. B.).

Symydobius Mordwilko.

Cornicles present, truncate, or with an evident neck and a broad low base. Antennae of six segments armed with numerous delicate hairs, sensoria somewhat oval or subcircular; sensorum at base of unguis not long and narrow. Cauda rounded; anal plate somewhat similar in shape, sometimes slightly indented. Fore wing with the media twice forked; hind wing with both media and cubitus present.

Only one species has been found in New England.

S. americanus Baker.

Can. Ent., 1, 319, 1918.

Therioaphis Walker.

Cornicles truncate, rather constricted mesad of apex. Antennae of six segments without prominent hairs and armed with subcircular or narrowly oval sensoria. Fore wing with the media twice branched; hind wing with both media and cubitus present. Prothorax rather elongate. Anal plate deeply bifid, the lobes distinctly separated at the base. Cauda knobbed and usually somewhat elongate. Species often large and distinctly colored.

Key to Species.

1. Entire margin of wing with a rather broad dark brown band 2
Margin of wing not so marked **ononidis**
2. Antennae distinctly annulated with dark brown; segment iii with
10-12 oval sensoria; tips of the wing veins marked with brown
Antennae uniform yellowish or dusky; segment iii with about 4
subcircular sensoria; tips of wing veins not marked with brown
tiliae
bellus

T. bellus (Walsh). *Aphis bellus* Walsh.

Proc. Ent. Soc. Phila., i, 299, 1862.

T. ononidis (Kaltenbach). *Callipterus trifolii* Monell.

Stett. Ent. Zeit., vii, 173, 1846.

T. tiliae (Linnaeus). *Aphis tiliae* Linnaeus.

Syst. Nat., Edn. 10, 452, 1758.

On *Tilia*, New Haven, 14 July, 1909 (A. I. B.).

Subtribe CHAITOPHORINA.

Forms living on the foliage and twigs of trees or occasionally on other plants, differing from the Callipterina in being clothed with long hairs; cornicles reduced; oviparous forms wingless; males winged, wingless or intermediate in the same species; dimorphic forms sometimes developed.

Key to Genera.

1. Cauda quite distinctly knobbed 2
Cauda not knobbed but rounded 3
2. Antennae of 5 segments **Sipha**, p. 285
Antennae of 6 segments **Chaitophorus**, p. 281
3. Body elongate; small dimorphic forms developed **Periphyllus**, p. 283
Body not elongate; no dimorphic forms developed
Neothomasia, p. 283

Chaitophorus Koch.

Cornicles present, truncate, rather prominent. Antennae of six segments, armed with subcircular sensoria and many slender hairs.

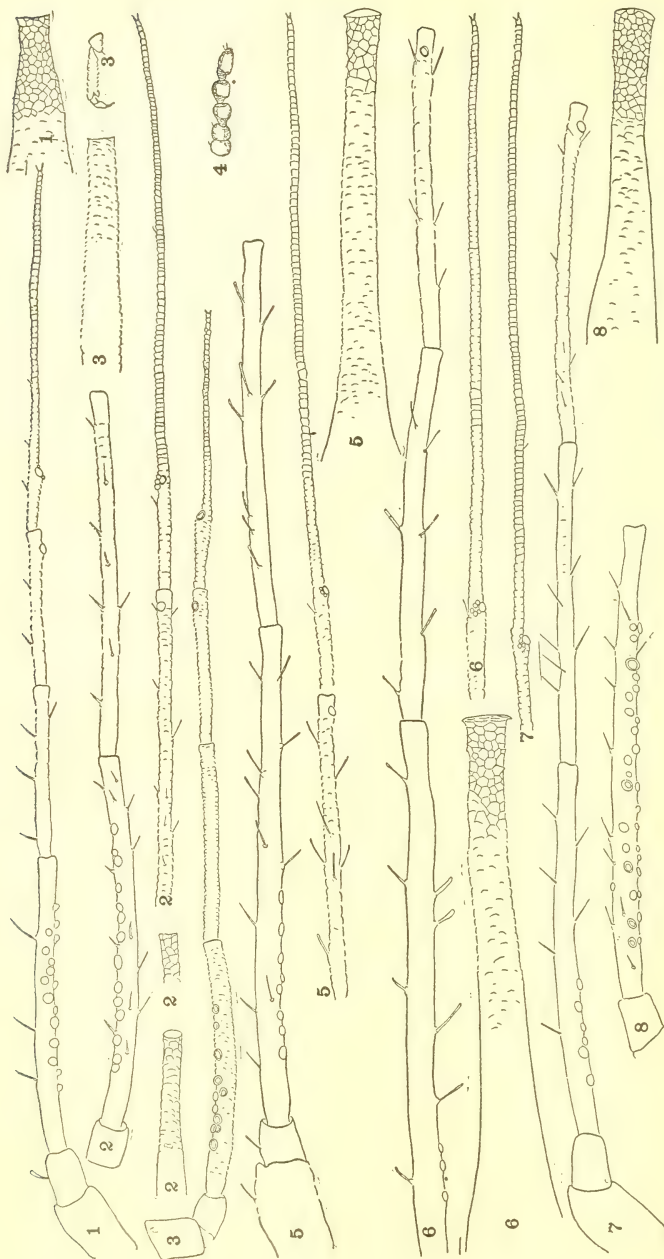


FIG. 30. Antennae, cornicles and tarsi of aphids (viviparous females). (1) *Macrosiphum sanborni* Gillette,—apterous. (2) *Macrosiphum fulvae* Oestlund,—alate. (3) *Macrosiphum illinoensis* Shimer,—alate. (4) *Chermes floccus* Patch. (5) *Macrosiphum lili* Monell,—alate. (6) *Macrosiphum lili* Monell,—apterous. (7) *Macrosiphum eupatorii* Williams,—apterous. (8) *Macrosiphum eupatorii* Williams,—alate. All greatly enlarged. Drawing by Dr. Edith M. Patch.

Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda distinctly knobbed; anal plate entire, sometimes slightly indented. Sexual forms not differing markedly from the viviparous ones. Males winged, intermediate and apterous often in the same species.

Forms living usually upon foliage. No small dimorphic forms developed.

*Key to Species.**

- Vertex and crown covered with reticulate areas; segment iv of antennae with 4-6 sensoria; dorsum of apterous form reticulate
nigrae
- Vertex and crown without reticulations but these replaced by granulations; segment iv of antennae with usually not more than 2 sensoria; apterous form granulate**viminalis**

C. viminalis Monell. *C. stevensis* Sanborn.

Bull. U. S. Geol. Geog. Surv. Terr., v, 31, 1879.

On *Populus grandidentata*.

New Haven, 29 June, 1914 (M. P. Z.).

C. nigrae Oestlund. *C. cordata* Williams.

Aphid. Minn., 49, 1886.

On willow.

Yalesville, 15 July, 1909 (W. E. B.).

Neothomasia Baker.

(n. n. for *Thomasia* Wilson.)

Cornicles present, truncate in form. Antennae of six segments armed with subcircular sensoria. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda and anal plate both rounded.

Forms living in colonies upon the leaves or bark of trees; no small dimorphic forms developed.

N. populicola (Thomas). *Chaitophorus populicola* Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 10, 1877.

The only species recorded from New England.

On *Populus*.

New Haven, 22 July, 1909 (A. I. B.).

Periphyllus Van der Hoven.

Cornicles truncate, often sculptured. Antennae of six segments (not including the dimorphs) armed with oval sensoria. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda and anal plate rounded.

* *Chaitophorus delicata* Patch, known only from the apterous forms, is not included in the key.



FIG. 31. Antennae, cornicles and tarsi of aphids (viviparous females). (1) *Drepanosiphum platanoide* Schrank. (2) *Siphocoryne xylostici* Schrank,—alate. (3) *Siphocoryne capreae* Fabricius. (4) *Rhopalosiphum serotinae* Oestlund,—alate. (5) *Rhopalosiphum serotinae* Oestlund,—apterous. (6) *Myzus cerasi* Fabricius,—alate. (7) *Aphis laburni* Kaltenbach,—alate. (8) *Aphis vernoniae* Thomas,—alate. (9) *Aphis samborni* Patch,—alate. (10) *Aphis cephalanthi* Thomas,—alate. (11) *Aphis monardae* Oestlund. (12) *Thecabius patchii* Gillette. (13) *Neoprociphilus corni* Fabricius. (14) *Prociphilus imbricator* Fitch. (15) *Anoecia corni* Fabricius. All greatly enlarged. Drawing by Dr. Edith M. Patch.

Forms living upon the foliage of trees. Small lamellate or hairy dimorphic forms developed in summer; bodies usually elongate.

Key to Species.

1. Segment iii of antennae with 4 to 9 sensoria in a more or less even row 2
 Segment iii of antennae with 16-24 sensoria somewhat irregularly placed on the basal three-quarters of the segment **americanus**
2. Unguis of segment vi of antenna less than three times as long as base **negundinis**
 Unguis of segment vi of antenna much more than three times as long as base, often more than four times as long **lyropicta**

Key to Dimorphs of Species.

1. Antennae considerably shorter than body; base of distal segment one-third as long as unguis 2
 Antennae nearly as long as the body; base of distal segment about one-quarter as long as unguis **americanus**
 2. Base of distal segment one-third to one-half as long as unguis **negundinis**
 Base of distal segment fully as long as unguis **japonicus***
- P. americanus** Baker. *Chaitophorus americanus* Baker. (Fig. 28, 16.)

Jour. Econ. Ent., 10, 428, 1917.

On sugar maple.

Brookfield Center, 10 May, 1913 (C. Holder).

P. lyropicta (Kessler). *Chaitophorus lyropictus* Kessler.

Nova Acta, Deutsch. Akad. Nat., li, 171, 1886.

On Norway maple.

Mcriden, 26 June, 1912 (Louis A. Gudebrod).

P. negundinis (Thomas). *Chaitophorus negundinis* Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 10, 1877.

Sipha Passerini.

Cornicles truncate, short, almost mere rings. Antennae of five segments armed with large circular sensoria. Body form flat, entire insect often covered with long, stout hairs. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda knobbed. Anal plate rounded. Only one species recorded from New England.

S. glyceriae (Kaltenbach). *Aphis glyceriae* Kaltenbach.

Mon. der Pflanz. 113, 1883.

Subtribe DREPANOSIPHINA.

Cornicles present, usually prominently developed; cauda as a rule knobbed and the anal plate entire, slightly indented or bilobed. Oviparous female with a long drawn-out ovipositor.

* This species is known only from the dimorph and it has been taken only in Pennsylvania.

Forms living on the foliage of plants, usually more or less solitary in habit, often strikingly colored.

Key to Genera.

Cornicles quite long and somewhat swollen in the middle	Drepanosiphum, p. 286
Cornicles not especially prominent and with the swelling at the base	Drepanaphis, p. 286

Drepanaphis Del Guercio.

Cornicles large but rather narrow toward the distal extremity and distinctly swollen at the base. Antennae of six segments armed with subcircular or oval sensoria. Fore wing with the media twice branched, hind wing with both media and cubitus present. Cauda knobbed; anal plate somewhat indented.

Forms somewhat solitary on the leaves of trees; males usually winged.

Key to Species.

Abdomen with a bilobed tubercle on dorsum and with three other pairs. Sensoria usually extending over entire segment ... **acerfoliae**
Abdomen usually without pairs of tubercles other than the bilobed one, never with three pairs. Sensoria usually located at base **monelli**

D. *acerifoliae* (Thomas). *Siphonophora acerifoliae* Thomas.
Phymatosyphum acerifoliae (Thomas) Davis.

Ill. St. Lab. Nat. Hist., Bull. 2, 4, 1877.

This is a well-marked species with bordered wing veins and prominent tubercles on dorsum of abdomen.

On cut leaf maple.

New Haven, 3 Aug., 1909 (A. I. B.); on sugar maple, New Haven, 15 June, 1910, 8 June, 1911 (G. A. Cromie); 1 July, 1913 (B. H. W.); Hamden, 6 June, 1913 (W. E. B.); Hartford, 3 June, 1915 (Hartford Forestry Co.).

D. monelli Davis.

Ann. Ent. Soc. Am., ii, 197, 1909.

Drepanosiphum Koch.

Cornicles very long subcylindric or swollen in the middle. Antennae of six segments armed with oval or subcircular sensoria. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda knobbed. Anal plate slightly indented.

D. platanoides (Schrank). *Aphis platanoides* Schrank. (Fig. 31, I.)

Fauna Boica, ii, 112, 1801.

The only species recorded from New England.

On Sycamore maple.

Stonington, 29 May, 1909 (W. E. B.).

Subtribe PHYLLAPHIDINA.

Forms living free or in pseudo galls. Sexual forms often both alate, sometimes, however, apterous or intermediate; oviparous female producing several eggs. Flocculent wax often abundant. Cornicles present; antennae of six segments with the unguis usually short, sensoria elongate or subcircular; cauda knobbed or rounded, anal plate often bilobed or deeply divided; wax glands large.

Key to Genera.

- Cauda rounded; anal plate entire **Tamelia**, p. 287
 Cauda knobbed; anal plate somewhat bilobed **Phyllaphis**, p. 287

Phyllaphis Koch.

Cornicles present as chitinized rings which are very slightly elongated on low conical bases. Antennae of six segments, long and slender, minutely setose, sensoria narrowly oval. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda knobbed, anal plate bilobed. Large wax glands present.

Forms living on foliage sometimes causing curling of the leaves. Males winged; oviparous females apterous.

P. fagi (Linnaeus). *Aphis fagi* Linnaeus.

Syst. Nat., Edn. 12, 735, 1767.

The only species recorded from New England.

Southport, 31 May, 1906; Farmington, 11 July, 1906; on beech, New Haven, 14 June, 1909 (B. H. W.); Norwich, 17 Sept., 1910.

Tamelia Baker.

Cornicles present as rings on elevated conical bases. Antennae of six segments armed with narrow sensoria. Fore wing with the media once branched (often twice branched); hind wing with both media and cubitus present; cauda and anal plate both rounded. Large wax plates often present.

Forms living in pseudo galls or on the foliage; oviparous female often winged.

Type: *Pemphigus coweni* Cockerell.

Key to Species.

- Forming galls on bearberry; oviparous females winged **coweni**
 Forming woolly colonies on oak leaves; oviparous females not winged **quercifoliae**

T. quercifoliae (Gillette). *Phyllaphis quercifoliae* Gillette.

Ent. News, xxv, 272, 1914.

Specimens of *quercifoliae* from Gillette indicate that *quercicola* Baker is the same species, since great variation occurs. Winged,

wingless and intermediate males are found. Sometimes in one locality the males are nearly all apterous, sometimes nearly all winged.

T. coweni (Cockerell). *Pemphigus coweni* Cockerell.

Can. Ent., xxxvii, 392, 1905.

Subtribe FULLAWAYINA.

This subtribe is an evident specialization from the Chaitophorina by the reduction and total lack of the cornicles. It bears the same relation to the Chaitophorina that the Monaphidina does to the Callipterina. Only one genus is represented.

Fullawayia Essig.

Cornicles absent; antennae of six segments, sensoria small and subcircular. Cauda rounded; fore wing with the media twice branched. Hind wing with both media and cubitus present.

Forms living commonly on the roots of plants.

F. saliciradicis Essig.

Pom. Coll. Jour. Ent., 4, 737, 1912.

The only species recorded from New England.

Subtribe PTEROCOMMINA.

Forms living on the bark of poplars and willows; bodies prominently hairy; cornicles often prominently developed but showing much variety among the species; cauda and anal plate rounded; oviparous females wingless; males showing winged, wingless and intermediate forms in the same species.

Key to Genera.

Cornicles cylindrical	Pterocomma , p. 289
Cornicles more or less swollen	Melanoxantherium , p. 288

Melanoxantherium Schouteden.

Cornicles variable in size but usually more or less elongate and swollen; antennae of six segments, sensoria oval or subcircular. Fore wing with the media twice branched; hind wing with both media and cubitus present. Cauda and anal plate rounded.

Key to Species.

1. Cornicles with a distal flange and not so abruptly constricted at their distal extremity **2**
 Cornicles without a distinct flange and abruptly constricted at distal extremity **focculosum**
2. Cornicles much more than twice as long as their greatest diameter **3**
 Cornicles about twice as long as their greatest diameter **smithiae**
3. Cornicles much longer than hind tarsi **4**
 Cornicles about equal in length to the hind tarsi **medium**
4. Cornicles about twice as long as the hind tarsi **5**

- Cornicles much more than twice as long as the hind tarsi, much swollen in the middle and bright orange in color **salicis**
5. Unguis of segment vi of antenna about equal in length to the cornicles and about twice as long as base **bicolor**
 Unguis of segment vi considerably shorter than the cornicles and not twice as long as base **populifoliae**
- M. bicolor** (Oestlund). *Melanoxanthus bicolor* Oestlund. (Fig. 26, 7-8.)
 Aphid. Minn., 36, 1887.
- M. flocculosum** Weed. *Melanoxanthus flocculosus* Weed. (Fig. 26, 11-12.)
 Ins. Life, iii, 291, 1891.
- M. populifoliae** (Fitch). *Aphis populifoliae* Fitch. (Fig. 26, 15-16.)
 Homop. N. Y. St. Cab., 66, 1851.
- M. medium** (Baker). *Pterocomma media* Baker. (Fig. 26, 1-2.)
 Jour. Econ. Ent., 10, 4431, 1917.
 On poplar.
 Manchester, 3 Sept., 1909 (A. I. B.); on Carolina poplar, New Canaan, 21 Sept., 1909 (A. I. B.).
- M. salicis** (Linnaeus). *Aphis salicis* Linnaeus. (Fig. 26, 13-14.)
 Syst. Nat., Edn. 10, 453, 1758.
- M. smithiae** (Monell). *Chaitophorus smithiae* Monell. (Fig. 26, 5-6.)
 Bull. U. S. Geol. Geog. Surv. Terr., v, 32, 1879.
 On poplar.
 New Canaan, 9 Oct., 1902; on willow, New Haven, 30 Aug., 1909 (A. I. B.); on poplar, New Canaan, 19 Sept., 1910 (W. E. B.).
- No species of the genus *Pterocomma* has as yet been definitely recorded from New England.

Subtribe SALTUSAPHIDINA.

Forms living usually on the foliage of sedges; bodies elongate, eyes without ocular tubercles; legs often modified for leaping; sexes usually both apterous; cornicles reduced; antennae held out in front of body.

Key to Genera.

- Head considerably elongate; cornicles cup-shaped; legs modified for leaping **Saltusaphis**, p. 289
 Head not much elongate; cornicles mere rings; legs not modified for leaping; oviparous female with prominent wax glands
Thripsaphis, p. 290

Saltusaphis Theobald.

Cornicles truncate or cup-shaped; antennae of six segments,

N. B. *Melanoxantherium antennatum* Patch is known only from the oviparous female.

minutely setose; sensoria small and subcircular. Head elongate, ocular tubercles absent. Fore wing with the media twice branched, hind wing with the cubitus usually absent. Cauda knobbed, anal plate divided, caudal extremity of abdomen sometimes bilobed. Body often covered with modified spines.

Key to Species.

Body without prominent hairs excepting simple ones on the caudal portion; vertex strongly conical **elongatus**
 Body with knobbed hairs about 0.016 mm. long; vertex not strongly conical **americanus**

S. americanus Baker. (Pl. ix, 1.)

Can. Ent., xlix, 3, 1917.

S. elongatus Baker. (Pl. ix, 3.)

Can. Ent., xlix, 4, 1917.

Thripsaphis Gillette.

Cornicles present as slightly elevated rings. Antennae of six segments armed with subcircular sensoria. Eyes without ocular tubercles. Fore wing with the media twice branched; hind wing with the cubitus sometimes absent. Cauda knobbed; anal plate divided; body with spine-like hairs.

Forms living free on sedges and grasses; sexes apterous; oviparous female with large wax plates.

T. balli (Gillette). *Brachycolus balli* Gillette.

Can. Ent., xl, 67, 1908.

The only species recorded from New England.

Tribe **APHIDINI**.

The New England species belonging to the Aphidini according to current usage fall into the following genera: *Aphis*, *Anuraphis*, *Brevicoryne*, *Hyadaphis*, *Hyalopterus*, *Liosomaphis*, *Mastopoda*, *Rhopalosiphum* and *Siphocoryne*. Perhaps the common characteristic which comes nearest to separating them from the *Macrosiphini* is the absence of a distinct frontal tubercle at the base of the antenna; and there is a vague borderland even on this character. For the most part, however, there is no difficulty in distinguishing the two groups.

Aphis, **Anuraphis**, **Brevicoryne**, **Hyalopterus**.

The four genera indicated and the others closely allied, on account of the "borderland" species are still perhaps most easily handled if keyed together.

Key to Species.

1. Hind wing with M and Cu both present 2
 Hind wing with but one discoidal vein **setariae**
2. Cornicle longer than ii or if not then cauda elongate 3

- Cornicle not longer than antennal segment ii. Cauda abbreviated and blunt *rumexicolens*
3. Cornicle shorter than or subequal to distal segment of hind tarsus,* constricted more or less at base, distinctly though slightly swollen 4
 Cornicle longer than distal segment of hind tarsus or if not then not swollen and not constricted at base 7
4. Cauda elongate with constriction near middle 5
 Cauda short and with no constriction 6
5. Antennal segment v as long as iv; iv with sensoria *atriplicis*
 V shorter than iv; iv with sensoria *arundinis*
6. Beak not reaching beyond second coxae *brassicacae*
 Beak reaching third coxae or beyond *tulipae*
7. Distal filament distinctly longer than base of vi 8
 Antenna with distal filament not distinctly longer than base of vi *spiraephila*
8. Spring alate female without noticeable sensoria on hind tibia 9
 Spring alate female with conspicuous sensoria on hind tibia *viburnicola*
9. Antennal segment iii conspicuously studded with sensoria, apparently over entire surface 10
 III with sensoria more or less numerous but not thickly studded over apparently entire surface and not confined to a row 16
 III with few to several (rarely 20) sensoria in regular or irregular row 20
10. Cornicle shorter than filament of vi 11
 Cornicle as long as filament of antennal segment vi. Prominent tubercle dorsad of cauda *saliceti*
11. Beak not reaching third coxae 12
 Beak extending easily to third coxae *symporicarpi*
12. Antennal segment v with secondary sensoria 13
 V without secondary sensoria *bakeri*
13. Cornicle subequal to v or longer 14
 Cornicle plainly shorter than antennal segment v *crataegifoliae*
14. Cauda shorter than one-half cornicle 15
 Cauda longer than one-half cornicle *varians*
15. Black aphid on peach *persicae-niger*
 Rosy aphid on apple *roseus*
16. Beak at most not reaching third coxae 17
 Beak easily reaching third coxae *cardui*
17. Second fork distinctly nearer to margin than to first fork 18
 Wing with second fork M about midway between first fork and margin of wing *bakeri*
18. Cauda broadly conical, not with evident constriction near middle .. 19
 Cauda elongate and usually with constriction near middle 35
19. Cornicle and antennal segment iv subequal in length. Spring forms on *Viburnum* *viburniphila*
 Cornicle and v subequal. On *Prunus* *tuberculata*
20. Cauda broadly conical, not with evident constriction near middle 21
 Cauda elongate and usually with constriction near middle 22
21. Cornicle not longer than antennal segment v *folsomi*
 Cornicle distinctly longer than v *forbesi*
22. Distance between second fork of M and margin of wing not more than one-third as long as distance between first and second fork 23
 Distance between second fork of M and margin of wing plainly more than one-third as long as distance between first and second fork 24

* Measured exclusive of claws.

23. Cornicle shorter than iii 33
 Cornicle longer than antennal segment iii *salicicola*
24. Antennal segment iii shorter than iv + v 25
 III at least subequal to iv + v *maidiradicis*
25. Cornicle nearly or quite as long as filament of antennal segment vi 26
 Cornicle plainly shorter than filament of vi 29
26. Filament more than twice as long as base 27
 Base of antennal segment vi as long as or longer than one-half
 the filament *medicaginis*
27. Filament subequal to v + base of vi 28
 Filament of antennal segment vi about three-fourths the length of
 v + base of vi *laburni*
28. Antennal iii with about four or five sensoria *rubiphila*
 III with about eight to ten sensoria *pomi*
29. Cornicle subequal to or longer than antennal segment iv 30
 Cornicle shorter than iv 34
30. Cornicle distinctly shorter than iii 31
 Cornicle and antennal segment iii subequal *spiraecola*
 (sometimes *gossypii*)
31. Antennal segment iv typically with sensoria 32
 IV typically without sensoria *gossypii*
32. Sensoria of antennal segment iv typically confined to distal two-
 thirds of segment and often grouped rather than in a row .. *sanborni*
 Sensoria of iv in row and not typically confined to distal two-thirds
 of segment *abbreviata*
33. Cornicle at least three times as long as second joint of hind tarsus
 exclusive of claw *coreopsidis*
 Cornicle about twice the length of second tarsal joint *furcata*
 Cornicle distinctly less than twice the length of second tarsal joint
 (see also 21) *maidiradicis*
34. Filament of antennal segment vi about three times as long as base
cerasifoliae
 Filament about two times length of base *sedi*
35. Cornicle plainly shorter than twice the length of second joint of
 tarsus (exclusive of claws) 36
 Cornicle at least approximately as long as twice the length of tarsus 38
36. Wing veins ordinary 37
 Wing veins noticeably heavy and a little blurred *pseudobrassicæ*
37. Antenna with filament of vi hardly more than twice the length of
 base of vi *maidis*
 Filament of vi more than twice the length of base *pseudoavenæ*
38. Cornicle distinctly longer than segment iv of antenna 39
 Cornicle subequal to iv (or at most not distinctly longer) 41
39. Filament more than twice as long as base 40
 Base of antennal segment vi as long as one-half the filament
rufomaculata
40. Abdomen green. Species occurring on *Helianthus* and *Cornus* ..
helianthi
 Abdomen black or dark red with rows of white pulverulent spots
 on dorsum. On *Populus* *davisi*
41. Antennal segments iv + v distinctly longer than iii 42
 IV + v subequal to iii or not distinctly longer
42. V without secondary sensoria 43
 Antennal segment v with secondary sensoria *varians*
43. Base of vi about one-half as long as filament and as much as two-
 thirds as long as v 44
 Base of antennal segment vi about one-third as long as filament
 and about half as long as v *rumicis*

44. Hind tibia about three-fourths as long as Cu of fore wing *cornifoliae*
Hind tibia about five-sixths as long as Cu of fore wing ... *asclepiadis*

Aphis Linnaeus.

A. abbreviata Patch.

Me. Agr. Expt. Sta., Bull. 202, 170, 1912.

A. asclepiadis Fitch.

Homop. N. Y. St. Cab., 65, 1851.

This species is figured by Gillette (1910).

A. cardui Linnaeus. *Aphis pruni* Koch. (*Aphis prunifoliae* Fitch of original description in part, of Thomas, 1879 and later American authors, except Pergande, up to 1917).

Syst. Nat., Edn. 10, 452, 1758.

Notes and figures of this long-beaked aphid are given by Patch (1914b).

On European plum, West Haven, 6 June, 1914 (Joseph Lesche).

A. cephalanthi Thomas. (Fig. 31, 10.)

Ill. St. Lab. Nat. Hist., Bull. 2, 11, 1877.

The buttonbush aphid is described and figured by Davis (1909b).

A. cerasifoliae Fitch.

Nox. and Ben. Ins. N. Y., 1, 131, 1856.

This choke cherry aphid is described and figured by Patch (1914b).

On *Prunus virginiana*, Cheshire, 14 July, 1909 (B. H. W.); on choke cherry, New Haven, 24 June, 1913 (W. E. B.).

A. coreopsidis (Thomas). *Siphonophora coreopsidis* Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 7, 1877.

A. davisi Patch.

Jour. Econ. Ent. 10, 418, 1917.

This species was recorded as *Aphis populifoliae* Fitch by Davis (1910b), as *A. populifoliae* Davis by Patch (1913a) and *A. davisii* by Patch (1917a).

On poplar, New Haven, 25 June, 1903 (B. H. W.).

A. folsomi Davis.

Ent. News, xix, 143, 1908.

Described and figured by Davis (1908).

On *Ampelopsis quinquefolia*, Colebrook, 2 July, 1914 (Howard Bement).

A. forbesi Weed.

Ohio Agr. Expt. Sta., Bull. ii, 148, 1889.

Figures of this strawberry species are given by Sanderson (1901).

A. furcata Patch.

Me. Agr. Expt. Sta., Bull. 233, 259, 1914.

This tiny aphid is found on chokeberry.

A. gossypii Glover. *Aphis malvae* Koch. *Aphis cucurbiti* Buckton.

Rept. U. S. Com. Agr., 36, 1876.

This aphid is figured and described by Essig (1911c).

On melon plant, Suffield, 29 Aug., 1905 (B. Wilson); Westport, 18 July, 1911 (J. J. Marvin); on cucumber, New Haven, 22 July, 1909 (A. I. B.); on *Althaea*, New Haven, 3 Aug., 1909 (A. I. B.); on melon, Suffield, 31 Aug., 1905; on spinach, Hartford, 11 Feb., 1906; on melon, Branford, 5 Aug., 1908.

A. helianthi Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 26, 1879.

This green species is recorded from *Cornus* and from *Helianthus*. It is probably rather seriously involved in synonymy.

A. impatientis Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 12, 1877.

Figured by Davis (1911a).

A. laburni Kaltenbach. (Fig. 31, 7.)

Mon. der Pflanz., 85, 1843.

This seems to be the first American record for this species.

On golden chain, Hartford, 22 June, 1914 (Mrs. W. Seliger).

A. lutescens Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 23, 1879.

This seems to be one of the lost species. It has been confused with *nerii*, and its status may be a bit uncertain. See also *nerii*.

A. maidi-radici Forbes.

Rept. Ins., Ill., 17, 64, 1891.

For a treatment of the corn root aphid see Vickery (1910).

On *Zea mays*, Stratford, 8 Oct., 1913 (F. J. Roundsveldt); on aster roots, Waterbury, 20 Sept., 1915 (Mrs. Fred Wilcox), West Haven, 3 Oct., 1916 (Mrs. H. L. Dorman).

A. maidis Fitch.

Nox. and Ben. Ins. N. Y., 2, 318, 1856.

A treatment of this corn leaf aphid is given by Davis (1909a) and figured in color by Forbes (1891).

On Kaffir corn, Old Mystic, 17 Aug., 1912 (C. I. Eldridge); on corn, New Canaan, 29 Sept., 1909 (A. I. B.); Stratford, 10 Sept., 1913.

A. medicaginis Koch.

Die Pflanz. Aphid, 94, 1854.

This species is described and figured by Essig (1911b).

A. monardae Oestlund. (Fig. 31, 11.)

Aphid, Minn., 58, 1887.

The original description (1887) is apparently the latest published

record for this species though it has been collected on *Monarda punctata* in the East.

A. nerii Boyer.

Ann. Soc. Ent. Fr., x, 179, 1841.

This oleander aphid is described and figured by Essig (1911b). The synonymy is a little uncertain. Swain (1919a) gives the case to date.

On *Asclepias incarnata* (var. *pulchra*). New Haven.

A. persicae-niger Smith.

Ent. Amer., vi, 101, 1890.

For figures of this aphid see Gillette (1908a).

Peach roots, South Manchester, 19 Aug., 1914.

A. pomi De Geer. Green apple aphid. (Pl. vii, 2; eggs, Pl. xix, 9.)

Mem. des Ins., iii, 53, 1773.

This green aphid of the apple is described and figured by Sander-son (1902) and Gillette (1908a), and by Baker and Turner (1916a).

New Haven, 12 June, 1900; Newington, 5 Oct., 1900; Mount Carmel, 18 June, 1903; Windsor Locks, 30 July, 1903; West Haven, 17 July, 1903; Cheshire, 31 July, 1903; Higganum, 8 Sept., 1903; Warehouse Point, 21 April, 1904 (eggs); Farmington, 9 Feb., 1905 (eggs); Norwichtown, 18 July, 1905; Lisbon, 28 March, 1906 (eggs); North Haven, 2 July, 1906; Hillstown, 27 July, 1906; Hartford, 25 June, 1907; Mount Carmel, 25 June, 1907; Shelton, 2 Aug., 1907; South Glastonbury, 20 Nov., 1909; Winsted, 26 March, 1910 (eggs); East Granby, 14 July, 1910; Suffield, 2 May, 1911; Roxbury, 31 May, 1911; West Cornwall, 21 Aug., 1911; New Milford, 23 March, 1912 (eggs); Sharon, 6 July, 1912; Saybrook Junction, 9 July, 1912; Riverside, 19 July, 1912; Mystic, 22 July, 1912; New Haven, 24 July, 1912; Meriden, 8 March, 1913 (eggs); Stepney Depot, 23 May, 1913; Derby, 17 June, 1913; Branford, 8 July, 1913; New Canaan, 7 Feb., 1914 (eggs); Mount Carmel, 9 Feb., 1914 (eggs); New Haven, 9 Feb., 1914 (eggs); Westport, 3 June, 1914; Norwalk, 21 June, 1914; New Haven, 27 July, 1914; on quince, Meriden, 31 July, 1914; Stratford, 11 Aug., 1914; Meriden, 15 Aug., 1914; Milford, 15 Aug., 1914; Hartford, 16 Sept., 1914; Hartford, 27 Oct., 1914.

A. pseudoavenae Patch.

Me. Agr. Expt. Sta., Bull. 267, 293, 1917.

This aphid is sometimes confused with the "so-called" *avenae*.

A. pseudobrassicae Davis. (Pl. vii, 3.)

Can. Ent., xlv, 231, 1914.

This aphid common on turnip has been confused in collections and literature with *Aphis brassicae*, which is not strange as they have some of the same food plants. It is described and figured by Davis (1914e) and by Paddock (1915a).

On kale, New Haven, 16 Sept., 1916 (W. E. B.).

A. rubiphila Patch.

Me. Agr. Expt. Sta., Bull. 233, 269, 1914.

On *Rubus*.

A. rumexicolens Patch.

Jour. Econ. Ent., 10, 417, 1917.

This species is known only from Connecticut. For description and figures see Patch (1917a). It seems to come nearest the *Anuraphis* group.

On *Rumex acetosella*, Wallingford, 9 June, 1913 (W. E. B.).

A. rufomaculata Wilson. *Aphis chrysanthemicola* Williams.

Ent. News., xix, 261, 1908.

For description of this aphid see Wilson (1908).

A. rumicis Linnaeus.

Syst. Nat., Edn. 10, 451, 1758.

This aphid is characterized in the pupal stage by rows of pulverulent white spots on the black abdomen. It feeds upon a great variety of vegetation.

On milkweed, New Haven, 1 July, 1914 (M. P. Z.); on *Celastrus scandens*, Windsor, 19 June, 1912 (Mrs. Mary Allen); on rhubarb, Norwich, 22 June, 1914 (Frank S. Bunnell); on nasturtium, 18 July, 1913 (Hartford, A. B. Pimm); New Haven, 3 Aug., 1909 (A. I. B.); on Swiss chard, New Haven, 8 July, 1914 (M. P. Z.); on beets, Milford, 19 July, 1915 (W. E. B.); on rhubarb, Norwich, 22 June, 1914 (Frank S. Bunnell); on broad bean, Cos Cob, 8 June, 1910 (T. R. Smith); on Italian bean, Newington, 29 June, 1911; June 19, 1913 (W. E. B.); on *Euonymus*, North Haven, 19 June, 1912 (W. E. B.); on Lima beans, Madison, 22 July, 1909 (J. H. Stevens); on broad bean, New Haven, 21 June, 1909 (W. E. B.); on buttercup, New Haven, 21 June, 1909 (B. H. W.); on *Euonymus*, New Haven, 24 May, 1909 (W. E. B.); on *Hedera*, New Haven, Dec., 1902 (W. E. B.); on *Aralia*, New Haven, 18 June, 1901, (W. E. B.); on English ivy, New Haven, 11 Jan., 1904; on nasturtium, New Haven, 19 July, 1909 (A. I. B.).

A. saliceti Kaltenbach. (Fig. 28, 13.)

Mon. der Pflanz., 103, 1843.

This is an aphid inhabiting both *Salix* and *Umbelliferae* like *Siphocoryne capreae* and, except for the straight cornicles of *saliceti*, its characters would connect it with *Siphocoryne* rather than *Aphis*. It has been collected in Maine on *Salix*, *Heracleum*, parsnip and fennel. For description and figures see Patch (1916b). See also following species on parsnip.

New Haven, 13 July, 1909 (A. I. B.).

A. salicicola Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 1877.

This willow aphid is figured by Patch (1913a). *A. saliceti* is involved in synonymic difficulties in both Europe and America in which *salicicola* is also mixed. They are two good species but just what they should be called is not perhaps, yet certain.

A. sanborni Patch. (Fig. 31, 9.)

Me. Agr. Expt. Sta., Bull. 225, 52, 1914.

On *Ribes aureum*, New Haven, 3 June, 1909; 27 May, 1910 (W. E. B.).

A. sedi Kaltenbach.

Mon der Pflanz., 63, 1843.

An American record of this aphid is given by Patch (1911a).

A. setariae Thomas.* *Aphis scotti* Sanderson.

Ill. St. Lab. Nat. Hist., Bull. 2, 5, 1877.

This aphid is recorded from plum and from grasses.

A. spiraecola Patch.

Me. Agr. Expt. Sta., Bull. 233, 270, 1914.

Aphis spiraecella (1910b). Figured by Patch (1914b).

On *Spiraea*, New Haven, 18 June, 1901 (W. E. B.); on *Spiraea Van Houttei*, New Haven, 7 July, 1909 (A. I. B.).

A. spiraephila Patch.

Me. Agr. Expt. Sta., Bull. 233, 270, 1914.

This common *Spiraea* aphid is described and figured by Patch (1914b).

A. symphoricarpi Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 12, 1877.

This aphid of snow-berry has not received much attention in literature.

A. tuberculata Patch.

Me. Agr. Expt. Sta., Bull. 233, 261, 1914.

This is a conspicuous red and black aphid on black cherry.

A. varians Patch.

Me. Agr. Expt. Sta., Bull. 225, 56, 1914.

A *Ribes* aphid.

A. vernoniae Thomas. (Fig. 31, 8.)

Ill. St. Lab. Nat. Hist., Bull. 2, 10, 1877.

A. viburniphila Patch.

Me. Agr. Expt. Sta., Bull. 256.

This common aphid on *Viburnum* has been widely represented in collections for years.

On *Viburnum opulus*, New Haven, 12 June, 1912 (H. D. Clark); on *Viburnum plicatum*, New Haven, 20 May, 1913 (W. E. B.).

A. yuccae Cowen. *Aphis yucciola* Williams.

Hemip. Col., 122, 1895.

This species is figured by Davis (1911a).

On *Yucca*, New Haven, 12 July, 1909 (A. I. B.).

* This species is now known as *Hysteroneura* (*Heteroneura*) (*Aphis*) *setariae* (Thomas).

Anuraphis Del Guercio.

A. bakeri (Cowen). *Aphis bakeri* Cowen.

Hemip. Col., 118, 1895.

This species is described and figured by Gillette (1908b) and Patch (1915d). It migrates between *Pyrus* and allied plants, and clovers.

A. crataegifoliae (Fitch). *Aphis crataegifoliae* Fitch. *Aphis brevis* Sanderson.

Homop. N. Y. St. Cab., 66, 1851.

This aphid migrates from hawthorn to clover. For an account and figures see Patch (1915) and Baker (1919c).

A. roseus Baker. Rosy apple aphid.

Can. Ent., liii, 95, 1921.

For reference to this species, under the name of *A. sorbi* (of American authors) or *A. malifoliae*, see Sanderson (1902), Baker and Turner (1916f), and Matheson (1916a).

Stratford, 17 June, 1909; Wallingford, 18 June, 1909; West Haven, 19 June, 1909; Manchester, 22 June, 1909; Stamford, 8 July, 1910; Mystic, 5 June, 1911; Riverside, 17 June, 1912; Darien, 18 June, 1912; Lyme, 16 July, 1913; Hamden, 9 June, 1914; Moosup, 22 June, 1914; Rockville, 10 July, 1914; Middletown, 18 June, 1915; Farmington, 26 June, 1915; Milford, 14 July, 1915. Injury to fruit.

A. tulipae (Boyer). *Aphis gladioli* Felt. (Pl. vii, 4.)

Ann. Soc. Ent. Fr., x, 167, 1841.

This aphid is described and figured by Felt (1908).

Bristol, 17 June, 1919 (F. H. Bond).

A. viburnicola (Gillette). *Aphis viburnicola* Gillette.

Ent. News, xx, 280, 1909.

This common *Viburnum* aphid extends from the Atlantic to the Pacific states. It is described and figured by Gillette (1909a).

Brevicoryne Das.

B. atriplicis (Linnaeus). *Aphis atriplicis* Linnaeus. *Aphis chenopodii* Cowen.

Faun. Suec., 262, 1761.

For an account and figures of this aphid see Hayhurst (1909). This has also been honored by the generic name of *Uraphis-Hayhurstia*.

B. brassicae (Linnaeus). *Aphis brassicae* Linnaeus. Cabbage Aphid. (Pl. vii, 5.)

Syst. Nat., Edn. 10, 452, 1758.

For an illustrated account of this aphid see Herrick and Hungeate (1911). It has often been confused with *A. pseudobrassicae*. Its slightly swollen cornicles have sometimes placed it in *Siphocoryne*.

On cabbage, Milford, 21 July, 1902; Hamden, 14 Aug., 1913; on charlock, Farmington, 11 Aug., 1909 (W. E. B.).

Hyalopterus Koch.

H. arundinis (Fabricius). *Aphis arundinis* Fabricius. *Aphis pruni* Fabricius.

Syst. Ent., 734, 1775.

This species migrates between plum and reed grass. For description and figures see Patch (1914b). Also see Gillette and Bragg (1910).

On European plum.

New Haven, July, 1901 (W. E. B.).

Hyadaphis, Liosomaphis, Rhopalosiphum and Siphocoryne.

The species of this group are so woefully tangled as to generic synonymy and are so closely affiliated by connecting forms, that it is easier to key them together than to attempt to separate them on generic characters.

Key to Species.

1. Hind wing not extraordinary 2
Hind wing minuteserotinae
2. Species developing on vegetation other than grasses for at least part of the annual cycle 3
Species developing on grasses (Family Gramineae) for at least a part of the annual cycle. Cornicle weakly swollen, with distinct constriction before flangeprunifoliae (avenae)
3. Species developing on one or more plants of the family Rosaceae for at least a part of the annual cycle 4
Species developing on vegetation other than Gramineae and Rosaceae for at least a part of the annual cycle 5
4. Dark brown or wine-colored species on *Prunus*nymphaeae
Delicate green or yellowish species commonest on *Pyrus*. Cornicle weakly swollen with distinct constriction before flange ...
prunifoliae (avenae)
5. Caudal horn present 6
No caudal horn 8
6. Filament of vi shorter than iv + v 7
Filament of antennal segment vi longer than iv + v. Species on *Salix* or various genera of the Umbelliferaepastinaceae
7. Antennal segment iv without sensoria. Species on *Salix* or various genera of the Umbelliferaecapreae
IV with sensoria. Species on Umbelliferaecicutae
8. Species which may develop on Umbelliferae for at least part of the annual cycle 9
Species either never reported from Umbelliferae or with other host plants as well 10
9. Antenna of alate female rather thickly set with tuberculate sensoria. General color pale green. Cauda of apterous form large, long and broadxylostei
Antenna of alate female with secondary sensoria usually confined to more or less crowded and irregular row on segment iii. General color brown, wine or if green then not pale. Cauda of apterous form not unusualnymphaeae
10. Filament of vi distinctly longer than base 11

Filament of antennal segment vi not much longer than base of vi.

- Species on barberry **berberidis**
 11. Species dark brown, wine or green passing part of its life cycle on
 water plants or plants commonly growing in marshy places

nymphaeae

Species on *Lonicera* **xylostei**

Rhopalosiphum Koch.

R. nymphaeae (Linnaeus). *Aphis nymphaeae* Linnaeus, *Aphis butomi* Schrank, *Aphis aquaticus* Jackson. (*Aphis prunorum* Dobrowlansky ? Patch 1914h). Sometimes placed in *Siphocoryne*.

Faun. Suec., Rev. Edn. 260, 1761.

This aphid winters on plum where it becomes a serious pest during the spring. It migrates to water plants for the summer months. For life history notes see Patch (1915b) and for figures Patch (1914b).

On Japan plum, Southbury, June 2, 1901.

R. prunifoliae (Fitch). (*avenae* in part of American entomologists) (*Aphis fitchii* Sanderson). Apple grain aphid.

Nox. and Ben. Ins. N. Y., 1, 122, 1855.

This is the species most frequently meant when discussed in American literature as *Aphis* or *Siphocoryne avenae*. That this species must now be known as *prunifoliae* is due to the unfortunate preservation of a Fitch type not in accordance with the entire original description of *prunifoliae* which for the most part is applicable only to *cardui* (*prunifoliae* in part of original description).

The apple-grain aphid is treated by Baker and Turner (1919g) and Davis (1914f). It is close to *Aphis pseudoavenae* in structure and habits (Patch 1917b).

On apple, New Haven, 11, 29 Oct., 1909 (A. I. B.).

R. serotinae Oestlund. (Fig. 28, 15; Fig. 31, 4 and 5.)

Aphid, Minn., 76, 1887.

This strongly characterized aphid with robust veins, smooth, peculiar cornicles, and minute hind wings is found on *Solidago serotina*. Its comparatively abruptly conical cauda bears the same relation to the rest of *Rhopalosiphum* that the *Anuraphis* cauda does to that of *Aphis*.

On goldenrod, New Haven, 13 July, 1909 (A. I. B.).

Liosomaphis Walker.

L. berberidis (Kaltenbach). *Aphis berberidis* Kaltenbach.

Mon. der Pflanz., 95, 1843.

This barberry species has the antennal contradiction of distinct, though short, frontal tubercles in the apterous females which might

ally it with the Macrosiphini and a distal filament so short that it would render it somewhat conspicuous even among the Aphidini. It is frequently included under *Siphocoryne* or *Rhopalosiphum*.

Siphocoryne Passerini.

S. capreae (Fabricius). *Aphis capreae* Fabricius. (Fig. 31, 3.)
Syst. Ent., 734, 1775.

Like the foregoing species this inhabits *Salix* and various genera of the Umbelliferae. It is figured by Gillette (1911a) and by Theobald (1912).

The approved generic name for the three foregoing species has more recently been *Hyadaphis*. The erection in 1914 of the genus *Cavariella* appropriated *pastinaceae*, however, and logically adopted the second species with a caudal horn—*capreae*.

S. pastinaceae (Linnaeus). *Aphis pastinaceae* Linnaeus.
Syst. Nat., Edn. 10, 451, 1758.

This species inhabits *Salix* and various genera of the Umbelliferae. It is figured by Theobald (1912).

S. xylostei (Schrank). *Aphis xylostei* Schrank. "*Rhopalosiphum pastinaceae* Linnaeus" Gillette (1911a). (Fig. 28, 12; Fig. 31, 12.)

Fauna Boica., ii, 107, 1801.

This aphid is found on *Symphorocarpus* and *Lonicera* in the spring and migrates to parsnip and other umbelliferous plants for the summer.

Hartford, 18 July, 1913 (A. B. Pimm); on *Symphorocarpus*, New Haven, 13 Oct., 1909 (A. I. B.); on Tartarian honeysuckle, New Haven, 4 June, 1909 (W. E. B.); on parsnip, New Haven, 13 July, 1909 (A. I. B.).

MACROSIPHINI.

Amphorophora Buckton.

This genus as here used functions conveniently for those species which cannot go into *Rhopalosiphum* (as long as that genus holds *prunifoliae* (*avenae*)) on the one hand or into *Nectarosiphon* on the other. Its stability is not warranted but there is some precedence for this usage.

Key to Species.

- | | |
|---|-----------------|
| 1. Antennal sensoria of iii numerous | 2 |
| Antennal sensoria of iii in single row | <i>rhois</i> |
| 2. Antennal segment iii shorter than iv + v | <i>lactucae</i> |
| Antennal segment iii longer than iv + v | <i>nabali</i> |

A. lactucae (Kaltenbach). *Aphis lactucae* Kaltenbach.

Mon. der Pflanz., 37, 1843.

There is a difference of opinion as to whether *Aphis ribis* Linnaeus is this species or the species indicated as *Myzus ribis*

Linnaeus in this publication. This aphid passes the winter and spring on *Ribes* and the summer on *Sonchus* and *Lactuca*. For figures see Patch (1914a).

A. nabali (Oestlund). *Rhopalosiphum nabali* Oestlund.

Aphid, Minn., 34, 1887.

Since this species was published by Oestlund (1887) it has not appeared in literature. It is not, however, uncommon in the east on the upper stalk and flower heads of *Prenanthes* (*Nabalus*) *alba*.

A. rhois (Monell). *Rhopalosiphum rhois* Monell. *Amphorophora howardii* Wilson. (Pl. vii, 6.)

Bull. U. S. Geol. Geog. Surv. Terr., v, 27, 1879.

This aphid accepts *Rhus* for its winter host and various grasses for the summer.

On *Rhus glabra*, New Haven, 9 July, 1909 (A. I. B.).

Toxoptera Koch.

T. graminum Rondani.

Nuov. Ann. Sci. Nat. Rend., Ser. 3, vi, 10, 1852.

This highly economic species occurs frequently in literature, two references to which are Hunter (1909) and Webster and Phillips (1912).

Myzus Passerini.

Key to Species.

1. Large sensorium of antennal segment vi not much if any farther from juncture of v and vi than large sensorium of v 2
 - Large sensorium of antennal segment vi at least about four times as far from juncture of segments v and vi as large sensorium of v 3
2. Large sensorium of antennal segment v typically more than twice its diameter from end of segmentdispar
 - Large sensorium of v typically less than twice its diameter from end of segmentribis
3. Large sensorium of antennal segment vi conspicuously larger than neighboring sensoria which are about uniform 4
 - Large sensorium of vi approached in size by two of the neighboring sensoria which are larger than the otherscerasi
4. Sensoria of antennal segment iii more or less in a row 5
 - Sensoria of iii numerous, not in a row 7
5. Cornicle cylindrical 6
 - Cornicle swollenpersicae
6. Very small species on strawberries (*Fragaria*)porosus
 - Fair-sized species on wide range of plants, usually in greenhouse circumflexum
7. Sensoria abundant on antennal segment iv 8
 - Sensoria frequently present but few on antennal segments iv and v rosarum
8. Cornicle incrassate 9
 - Cornicle cylindricalbraggii
9. Wing veins ordinaryhippophaes
 - Wing veins strongly shadedviolae

M. braggii Gillette. *Capitophorus braggii* van der Goot.

Can. Ent., xl, 17, 1908.

For a critical study of this species which migrates from *Elaeagnus*, *Hippophaes* and *Shepherdia* to *Cirsium* and *Cynara*, see Gillette (1915a).

On *Elaeagnus longipes*, New Haven, 10 June, 1901 (W. E. B.).

M. cerasi (Fabricius). *Aphis cerasi* Fabricius. (Fig. 31, 6.)

Syst. Ent., 734, 1775.

This dark aphid is common on wild and cultivated cherry. It migrates to pepper-grass. It is figured by Patch (1914b). For life cycle and summer food plant, see Ross (1918b).

On cherry, Wilton, 28 June, 1902; New Britain, 7 June, 1909; Stratford, 7 June, 1909; Shelton, 30 June, 1911; New Haven, 12 June, 1912; Darien, 18 June, 1912; Meriden, 19 June, 1912; Madison, 2 July, 1912; Milford, 18 July, 1912; New Haven, 3 June, 1913; Winsted, 8 June, 1914; New Britain, 25 June, 1914; East Hartford, 26 June, 1914; Rockville, 7 June, 1915; Norfolk, 19 June, 1915; Greenwich, 12 July, 1915.

M. circumflexum (Buckton). *Siphonophora circumflexa* Buckton.

Mon. Brit. Aphid, 1, 130, 1876.

See Davis (1914c).

M. dispar Patch.

Me. Agr. Expt. Sta., Bull. 225, 50, 1914.

For this and also *M. ribis* see Haviland (1919b).

M. hippophaes (Koch). *Rhopalosiphum hippophaes* Koch, *Phorodon galeopsidis* Passerini, *Myzus elaeagni* Del Guercio (?), *Capitophorus hippophaes* van der Goot.

Die Pflanz. Aphid, 28, 1854.

The generic position of this species is a bit unstable. *Hippophae* and *Elaeagnus* serve as its winter hosts and *Lamium*, *Polygonum* and *Stachys* share the summer honors. For a critical review with figures see Gillette (1915a).

M. persicae (Sulzer). *Aphis persicae* Sulzer, *Aphis dianthi* Kaltenbach. Sometimes *Rhopalosiphum*.

Abg. Ges. Ins., 105, 1776.

This species has a range of food plants wide enough to entitle it to the term "general feeder." The figures published by Gillette (1908a) are excellent.

On pepper, New Haven, 30 July, 1909 (A. I. B.); on *Cineraria*, New Haven, 20 July, 1909 (A. I. B.); Station greenhouse, 10 Jan., 1910 (B. H. W.); on radish, Station greenhouse, New Haven, 20 May, 1913 (E. M. Stoddard); on peach, New Haven, 20 May, 1913 (W. E. B.); New Haven, 8 June, 1909 (B. H. W.); peach, Meriden, 31 May, 1912; New Haven, 12 June, 1912; Darien, 18 June, 1912; Norfolk, 19 June, 1915.

M. porosus Sanderson.

Rept. Del. Agr. Expt. Sta., 12, 205, 1900.

This strawberry aphid is described and figured by Sanderson (1901).

M. ribis (Linnaeus). *Aphis ribis* Linnaeus.

Syst. Nat., Edn. 10, 451, 1758.

Much confusion exists in the literature of this species. It is usually present in the reddish puffy places commonly seen on currant leaves. See Haviland (1919b).

On currant, Norwalk, 20 June, 1901; Milford, etc., Norwalk, 20 June, 1901; Milford, 3 June, 1902; New Haven, 1 June, 1909; Canaan, 9 June, 1909; Bridgeport, 31 May, 1910; Greenwich, 6 June, 1910; Hartford, 18 June, 1910; Watertown, 27 May, 1911; Bridgeport, 10 June, 1911; Derby, 3 June, 1912; Norwich, 22 June, 1912; Mount Carmel, 29 June, 1912; Ridgefield, 31 May, 1913; Cos Cob, 8 July, 1913.

M. rosarum (Kaltenbach). *Aphis rosarum* Kaltenbach.

Mon der Pflanz., 101, 1843.

The synonymy of this species seems to be somewhat tangled. It is figured by Patch (1914b).

On rose, Simsbury, 18 Apr., 1905. (Eggs, hatching.)

M. violae (Pergande). *Rhopalosiphum violae* Pergande.

Can. Ent., xxxii, 29, 1900.

The gibbous frontal tubercle and prominent antennal segment I have associated in this species with *Myzus*. It is at present (1920) placed with a small group of aphids known as the Pentalonina (Baker 1919h).

On violet, New Haven, 19 Feb., 1903.

Phorodon Passerini.**P. humuli** (Schrank). *Aphis humuli* Schrank. *Phorodon pruni* Scopoli. Hop Aphid.

Fauna Boica, ii, 110, 1801.

This economic species on hop and plum appears many times in literature. It is described and figured by Riley (1889).

Macrosiphum Passerini.*Key to Species.**

- | | |
|--|----------------------|
| 1. Species not developing exclusively on Compositae | 2 |
| Species developing on Compositae either exclusively or for a part of the life cycle | 29 |
| 2. Apex of cornicle with distinct reticulated area (e. g., <i>solanifolii</i>) | 3 |
| Apex of cornicle imbricated (e. g., <i>pisi</i>) or indifferently characterized (e. g., <i>pelargonii</i>) | 22 |
| 3. Apterous female with iii closely imbricated throughout. Setae of iii very short and stubby | <i>carpinicolens</i> |
| Apterous female not exceptional in foregoing respect | 4 |
| Species known only for Orchidaceae | <i>luteum</i> |
| 4. Apterous female with base of vi nearer three times length of ii than two and one-half times length of ii and base of vi more than 2 times length of hind tarsus | 5 |

* Tarsal measurements in this key include only second joint of tarsus exclusive of claw. Unless otherwise stated alate form is indicated.

- Apterous female with base of vi nearer two and one-half times length of ii than three times length of ii (or if not then base of vi not more than two times length of hind tarsus) 6
5. Cornicle with distal half having strong imbrications extending to area of reticulation *ptericolens*
 Cornicle without strong imbrications leading to area of reticulations *diervillae*
6. III with numerous sensoria not in a row 7
 III with sensoria confined approximately to single row 10
7. III of apterous female with sensoria not much exceeding basal half 8
 III of apterous female with sensoria extending over at least two-thirds length 9
8. Cornicle with distal area of reticulation approximately one-sixth its length *rosae*
 Cornicle with distal area of reticulation exceeding one-fourth its length *impatiensicolens*
9. Cornicle with area of reticulation less than one-eighth its length *albifrons*
 Cornicle with area of reticulation more than one-fifth its length .. *amelanchiericolens*
10. Fore wing with Cu and A heavily shaded 11
 Fore wing with Cu and A not heavily shaded, though sometimes darker than other veins 12
11. Vein A of fore wing conspicuously longer than cornicle .. *venaefuscae*
 Vein A of fore wing shorter than cornicle *coryli*
12. Developing on Magnoliaceae 13
 Not developing on Magnoliaceae 14
13. Base of vi about five times length of tip* of v *liriiodendri*
14. Cornicle with nearer one-fourth than one-third its length reticulated 15
 Cornicle with nearer one-third than one-fourth its length reticulated *granarium*
15. Cornicle with hardly more than one-seventh its length reticulated 16
 Cornicle with at least one-sixth its length reticulated 17
16. Cornicle conspicuously longer than vein A of fore wing .. *californicum*
 Cornicle conspicuously shorter than A *gaurae*
17. Cornicle not much shorter than either A or iii 18
 Cornicle distinctly shorter than either vein A of fore wing or antennal iii *onagrae*
18. Second joint of first tarsus less than one-half base of vi 19
 Second joint of first tarsus more than one-half base of vi 20
19. III with approximately distal one-sixth clear of sensoria *pseudocoryli*
 III with approximately distal one-half clear of sensoria *lilii*
20. Cornicle pale to dusky 21
 Cornicle deep black *pseudorosae*
21. All tibiae with base about setae paler giving a mottled appearance *asclepiadifolii*
 All tibiae with base about setae concolorous with adjacent area .. *solanifolii*
22. Developing on rose 23
 Not developing on rose 24
23. III of apterous female with one to few sensoria *dirhodum*
 III of apterous female with seventeen to twenty-five sensoria in a somewhat uneven row *pseudodirhodum*
24. III with sensoria in fairly regular single row 27
 III with sensoria not confined to single row 25
25. IV of alate female with sensoria (eight more or less) 26

* Distal part including sensorium.

M. asclepiadifolii (Thomas). *Siphonophora asclepiadifolii* Thomas.

Rept. Ins. Ill., 8, 58, 1879.

M. californicum (Clark). *Nectarophora californica* Clarke.
M. laevigatae Essig.

Can. Ent., xxxv, 254, 1903.

This willow aphid is described and figured by Essig (1911b) and Patch (1913a).

M. carpinicolens Patch.

Me. Agr. Expt. Sta., Bull. 282, 209, 1919.

M. cnici (Schrank). *Aphis cnici* Schrank. *Aphis cnici* Williams.

Fauna Boica, ii, 122, 1801.

For discussion and figures see Davis (1911a).

M. coryli Davis.

Can. Ent., xlv, 48, 1914.

M. crataegi (Monell). *Siphonophora crataegi* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 20, 1879.

For description and figures see Patch (1914b).

On *Crataegus Crus-galli*, New Haven, 8 Sept., 1910 (W. E. B.).

M. diervillae Patch.

Me. Agr. Expt. Sta., Bull. 282, 210, 1919.

M. dirhodum (Walker). *Aphis dirhodum* Walker.

Ann. Mag. Nat. Hist., iii, 43, 1849.

This species migrates between rose and grains. For figures see Patch (1914b).

M. erigeronensis (Thomas). *Siphonophora erigeronensis* Thomas.

Ill. St. Lab. Nat. Hist., Bull. 2, 7, 1877.

For figures see Gillette (1911b).

M. eupatoricolens Patch.

Me. Agr. Expt. Sta., Bull. 282, 214, 1919.

M. eupatorii (Williams). *Siphonophora eupatorii* Williams.

Aphid, Nebr., 77, 1911.

M. gaurae (Williams). *Siphonophora gaurae* Williams. *Siphonophora gaurina* Williams. (Fig. 30, 7 and 8.)

Aphid, Nebr., 79, 1911.

For discussion and figures of this species common on *Gaura* and *Oenothera* see Davis (1911a).

M. granarium (Kirby). *Aphis granaria* Kirby.

Trans. Linn. Soc. Lond., iv, 238, 1798.

For description and figures see Theobald (1913a).

On winter wheat, Meriden, 26 May, 1909 (B. H. W.); on rye, Meriden, 26 May, 1909 (B. H. W.).

M. gravicornis Patch.

Me. Agr. Expt. Sta., Bull. 282, 213, 1919.

M. hieracii (Kaltenbach). *Aphis hieracii* Kaltenbach.

Mon. der Pflanz., 17, 1843.

A common species on *Hieracium*. For description and figures see Theobald (1913a).

M. illinoiensis (Shimer). *Aphis illinoiensis* Shimer. *Siphonophora viticola* Thomas. (Fig. 30, 3.)

Prairie Farmer, xviii, 20, 316.

For discussion see Davis (1910b) and for life history of this *Viburnum*-grape aphid see Baker and Turner (1915). This species has hardly frontal tubercles enough to warrant its inclusion under *Macrosiphum* as usually restricted.

On grape, New Haven, July, 1905 (B. H. W.); New Haven, 24 July, 1912 (J. K. L.); New Haven, 29 July, 1914 (M. P. Z.).

M. impatiensicolens Patch. (Fig. 29, 5.)

Me. Agr. Expt. Sta., Bull. 282, 210, 1919.

M. kaltenbachii Schouteden. *Siphonophora alliariae* Koch (page 177). *Macrosiphum lactucae* (Patch 1914a)?

Mem. Soc. Ent. Belg., xii, 239, 1906.

For description and figures see Theobald (1913a).

M. lanceolatum Patch.

Me. Agr. Expt. Sta., Bull. 282, 215, 1919.

M. lilii (Monell). *Siphonophora lilii* Monell. (Fig. 28, 1; Fig. 30, 5 and 6.)

Rept. U. S. Com. Agr., 221, 1879.

This aphid is distinguished from *M. solanifolii* and other lily species by the distinctly black cornicles, as well as slight structural differences of antenna and cornicle.

On tiger lilies, New Haven, 5 July, 1901 (W. E. B.); on *Lilium auratum*, New Haven, 5 Aug., 1906 (F. B. Chillingworth); on *Lilium* sp., New Haven, 22 July, 1910 (W. E. B.).

M. liriodendri (Monell). *Siphonophora liriodendri* Monell.

Bull. U. S. Geol. Geog. Surv. Terr., v, 20, 1879.

This species is figured by Gillette (1911b).

On tulip tree, New Haven, 12 July, 1909 (A. I. B.); 28 July, 1910 (B. H. W.); Greenwich, 13 July, 1910.

M. luteola (Williams). *Siphonophora luteola* Williams.

Aphid, Nebr., 82, 1911.

On goldenrod, New Haven, 13 July, 1909 (A. I. B.); 26 July, 1912 (J. K. L.).

M. onagrae Patch.

Me. Agr. Expt. Sta., Bull. 282, 212, 1919.

M. pelargonii (Kaltenbach). *Aphis pelargonii* Kaltenbach.

For description and figures see Theobald (1913b).

M. pisi (Kaltenbach). *Aphis pisi* Kaltenbach. *Nectarophora destructor* Johnson.

Mon. der Pflanz., 23, 1843.

This species in collections and in literature has been sometimes confused with *solanifolii* Ashmead. For account and figures see Davis (1915a).

New Haven, July, 1899; Plantsville, July, 1899; Wolcott, July, 1899; Bridgeport, 24 July, 1901; sweet pea, New Haven, 20 July, 1909 (A. I. B.); Hamden, 13 June, 1913.

M. pseudocoryli Patch.

Me. Agr. Expt. Sta., Bull. 282, 212, 1919.

M. pseudodirhodum Patch.

Me. Agr. Expt. Sta., Bull. 282, 213, 1919.

M. pseudorosae Patch.

Me. Agr. Expt. Sta., Bull. 282, 206, 1919.

M. ptericolens Patch.

Me. Agr. Expt. Sta., Bull. 282, 210, 1919.

M. purpurascens (Oestlund). *Nectarophora purpurascens* Oestlund. *Myzus thalictri* Williams.

Aphid, Minn., 81, 1887.

For discussion and figures of this *Thalictrum* aphid see Davis (1911a).

M. rosae (Linnaeus). *Aphis rosae* Linnaeus. Rose Aphid.

Syst. Nat., Edn. 10, 452, 1758.

For description and figures see Theobald (1913a) and Patch (1914b).

On rose, New Haven, 7 June, 1909; Aug. 31, 1909 (A. I. B.).

M. rudbeckiae (Fitch). *Nectarophora rudbeckiae* Fitch. (Pl. viii, 1.)

Homop. N. Y. St. Cab., 66, 1851.

For figures see Gillette (1911b).

On golden glow, Whitneyville, 11 July, 1904; Bristol, 15 July, 1915.

M. sanborni Gillette. *Siphonophora chrysanthemicolens* Williams.

Can. Ent., xl, 65, 1908.

For description and figures of this aphid see Gillette (1908c).

On *Chrysanthemum*, New Haven, 26 July, 1909 (A. I. B.).

M. sonchi (Linnaeus). *Aphis sonchi* Linnaeus. (Fig. 29, 1.)

Syst. Nat., Edn. 12, 735, 1767.

For description and figures see Theobald (1913a).

On *Lactuca*, New Haven, 6 July, 1909 (A. I. B.).

M. solanifolii (Ashmead). *Siphonophora solanifolii* Ashmead. *S. citrifolii* Ashmead. Potato aphid. (Pl. viii, 2.)

Can. Ent., xiv, 92, 1882.

It is probable that this species has at least several synonyms.

It has been confused with *M. pisi* in collections and literature. It is best known in the spring on rose bushes and in the east on potatoes during the summer though it has a wide range of food plants. An account with figures of this aphid is given by Patch (1915c). See also Patch (1921a).

On potato, Fairfield, 1903; New Haven, 1909; Mystic, 18 July, 1912 (A. L. Beebe); Stonington, 18 July, 1912; Saugatuck, 16 July, 1914; on *Clematis crispa*, New Haven, 18 June, 1901 (W. E. B.); on tobacco, South Glastonbury, 27 July, 1904 (W. E. B.); on *Physalis pubescens*, Meriden, 21 Sept., 1908 (W. E. B.); on *Solanum Pseudocapsicum*, New Haven, 27 July, 1909 (A. I. B.); on tobacco, New Haven, 22 July, 1909 (A. I. B.); on tomato, New Haven, 26 July, 1909 (A. I. B.); on beet, New Haven, 30 July, 1909 (A. I. B.); on squash, New Haven, 21 July, 1909 (A. I. B.); on lettuce, New Haven, 22 July, 1909 (A. I. B.); on *Celastrus scandens* Windsor, 19 June, 1912 (Mrs. Mary Allen); on squash, New Haven, 8 July, 1914 (M. P. Z.); on *Asclepias* sp., New Haven, 29 June, 1916 (B. H. W.).

M. tanacetii (Linnaeus). *Aphis tanacetii* Linnaeus. (Fig. 29, 2 and 3.)

Faun. Suec., 260, 1761.

For brief description and figures see Gillette (1911b).

On tansy, New Haven, 9 July, 1909 (A. I. B.); Woodbridge, 29 June, 1911 (W. E. B.); on *Chrysanthemum Balsamita*, New Haven, 3 June, 1912 (W. E. B.); on tansy, Wallingford, 9 June, 1913 (W. E. B.).

M. taraxaci (Kaltenbach). *Aphis taraxaci* Kaltenbach.

Mon. der Pflanz., 30, 1843.

For description and figures see Theobald (1913a).

Nectarosiphon Schouteden.

Key to Species.

1. Sensoria of antennal segment iii not confined to single row 2
Sensoria of antennal segment iii in single row **spiraecola**
2. Cornicle plainly longer than antennal segment iii, distal tip of wing
with conspicuous smoky patch **rubicola**
Cornicle shorter than or subequal to antennal segment iii, distal tip
of wing nearly or quite clear **rubi**

N. rubi (Kaltenbach). *Aphis rubi* Kaltenbach.

Mon. der Pflanz., 24, 1843.

Antenna and cornicle of this species are figured by Gillette (1911b).

N. rubicola (Oestlund). *Macrosiphum rubicola* Oestlund.

Aphid, Minn., 60, 1887.

Antenna and cornicle of this species are figured by Patch (1914b).

N. spiraecola (Patch). *Macrosiphum spiraecola* Patch.

Me. Agr. Expt. Sta., Bull. 233, 271, 1914.

This species inhabits both cultivated *Spiraea* and *S. latifolia*. The color varieties range from bright green, pink and yellow to soft pale tones of the same color.

Mastopoda Oestlund.**M. pteridis Oestlund.**

Aphid, Minn., 53, 1887.

For description of this curious footless aphid on fern see Oestlund (1887) and for figures see Patch (1910b).

Microparsus Patch.**M. variabilis Patch.**

Ent. News, xx, 338, 1909.

On account of the unstable venation the figure accompanying the original description (Patch 1909c) was shown with M once forked. A twice forked M seems on further acquaintance to be typical and this genus, therefore, is given two places in the key. Host plant is *Desmodium canadense* and the species is not migratory.

Subfamily PEMPHIGINAE.

By ASA CHANDLER MAXSON.

Key to Tribes.

1. Subcosta of hind wing nearly straight. Not curving away from costa at base of diagonals 2
 Subcosta of hind wing curving away from costa before base of first diagonal, then curving back toward it beyond base of second more or less abruptly or in a long gradual curve 5
2. Secondary sensoria transverse, linear. Antennae of alate forms usually distinctly annular; six-jointed 3
 Secondary sensoria broadly oval to subcircular. Antennae of alate forms not distinctly annular; six-jointed 4
3. Stem mother with five-jointed antennae. M of fore wing once forked. Hind wing with one or two diagonals ERIOSOMATINI, p. 312
 Stem mother with four-jointed antennae. M of fore wing once forked or simple. Hind wing with one or two diagonals
 TETRANEURINI, p. 315
4. Permanent sensoria with fringe of celia. Joint ii of antennae subequal to i. Rudimentary gonopophyses two GEOICINI, p. 318
 Permanent sensoria without fringe of celia. Joint ii of antennae distinctly longer than i. Rudimentary gonopophyses wanting ..
 TRIFIDINI, p. 318
5. Subcosta of hind wing curving away from costa before base of first diagonal. Returning toward it in long gradual curve. Base of second diagonal obsolete for short distance. Wax pore plates composed of subcircular facets of irregular size, loosely arranged; those of abdomen not surrounded by chitinous ring
 MELAPHINI, p. 317
 Subcosta of hind wing curving away from costa before base of first diagonal curving toward costa again just beyond base of second diagonal. Base of second diagonal reach subcosta. Wax pore plates composed of many several-sided facets of uniform size closely arranged; those of abdomen surrounded by chitinous ring PEMPHIGINI, p. 319

Tribe **ERIOSOMATINI.**

The species of this tribe live in curled leaves, exposed on the twigs or on the roots of the host which is always a tree or shrub.

Stem mother with five-jointed antennae. Young of stem mother apterous. Third generation alate. Wax production highly developed. Wax pore plates usually composed of a single row of facets surrounding a central area which may or may not be faceted. Cornicles present; reduced to slightly raised rings. Antennae of alate forms usually distinctly annular; six-jointed. Sexes small, beakless; females laying but one egg.

Key to Genera.

- Hind wing with two diagonals. Secondary sensoria nearly encircling antennae **Eriosoma**, p. 312
 Hind wing with one diagonal. Secondary sensoria not encircling antennae to any extent **Georgia**, p. 314

Eriosoma Leach.

Stem mother with five-jointed antennae. Wax pore plates consist of irregularly shaped areas composed of many, several-sided facets. Plates not bordered by chitinous ring. Young of stem mother all apterous.

Third generation alate. Antennae six-jointed. Secondary sensoria narrowly linear, transverse. At least joints iii and iv distinctly annular.

M of fore wing once forked. Hind wing with both media and cubitus present. Cornicles present; reduced to slightly raised rings. Cauda short, broadly rounded.

Wax pore plates of all except stem mother composed of a central area surrounded by a single row of rather large facets. Sexuall small and beakless, antennae five-jointed. Female laying but one egg.

Species living in curled leaves, on bark and twigs or on roots of host plants.

Key to Species.

1. Combined length of antennal joints iv, v and vi about equal to or less than that of iii 2
 Combined length of antennal joints iv, v and vi greater than that of iii **americanum**
 (Fundatrigenia)
2. Joints v with annulations, vi with or without annulations 3
 Joints v and vi of antennae without annulations **ulmi**
 (Fundatrigenia)
3. Fifth joint of antennae with from four to nine annulations 4
 Fifth joint of antennae with from three to four annulations **pyricola**
 (Sexuparae)
4. VI normally without annulations 5
 VI normally with annulations 6

5. Number of annulations on joint v of antennae equal to or greater than that on iv, rarely less *lanigerum*
(Fundatrigenia)
- Number of annulations on joint v of antennae equal to or less than that on iv, rarely more *pyricola*
(Fundatrigenia)
6. Distance from tip of fore wing to fork of M and base of stigmal vein subequal 7
- Distance from tip of fore wing to fork of M less than that to base of stigmal vein *rileyii*
(Fundatrigenia)
7. Joint iv of antennae with from six to nine annulations. V with from five to nine *crataegi*
(Sexuparae)
- Joint iv of antennae with three to five annulations, v with four to six *lanigerum*
(Sexuparae)

E. americanum (Riley). *Schizoneura americana* Riley (in part of Riley and subsequent authors).

Bull. U. S. Geol. Geog. Surv. Terr., v, 4, 1879.

This common species causes a leaf roll on American elm similar to that on English elm due to *ulmi*. It has been confused in literature with the elm generations of both *ulmi* and *lanigerum*. It migrates to *Amelanchier*, the roots of which are inhabited by the summer generations. For life history account see Patch (1915a).

On elm, Madison, July 3, 1912 (P. S. Platt); Norfolk, 28 June, 1914 (Edward Quintard).

E. crataegi (Oestlund). *Schizoneura crataegi* Oestlund.

Aphid, Minn., 27, 1887.

E. lanigerum (Hausmann). *Aphis lanigera* Hausmann. *Eriosoma americana* (in part of Riley and of subsequent authors). (Pl. viii, 3.)

Ill. Mag. Ins., i, 440, 1802.

This, like the other American species of this genus, has the elm for its primary host plant. The stem female hatching from the overwintering egg on the elm starts the leaf deformation known as rosette or leaf cluster of *Ulmus americana* which is inhabited by her progeny. The spring migrants fly to the ventral surface of the leaves of *Pyrus* and *Crataegus* and their nymphs seek the bark of these trees (on trunk and on root). This species also has hibernating nymphs which persist through the winter on its secondary host plant, but the egg stage is normally passed only on *Ulmus*. For literature on this species see Baker (1915), Maxson (1915), and Patch (1916b).

On elm, New Haven, 4 June, 1904 (B. H. W.); on *Crataegus*, New Canaan, 15 Sept., 1905 (W. E. B.); on apple, Southington, 18 Apr., 1903; New London, 18 Sept., 1906; Fairfield, 26 Oct., 1908; New Britain, 10 June, 1910; Orange, 22 June, 1910; Groton, 29 June, 1910; New Haven, 1 July, 1910; Groton, 2 July, 1910; Seymour, 4 Oct., 1911; Putnam, 24 Oct., 1911; Clinton, 26 Oct., 1911; West Haven, 11 Dec., 1911; Riverside, 16 July, 1912; Sharon, 28 Oct., 1912; New London, 15 Apr., 1913; Milford,

20 May, 1913; Lyme, 7 June, 1913; Winsted, 18 Aug., 1913; Mount Carmel, 9 Feb., 1914; Clinton, 27 Mar., 1914; Bristol, 6 Nov., 1914.

E. lanuginosa (Hartig).

Zeit. fur Ent., iii, 367, 1841.

"During the summer of 1913 a gall resembling, very closely, those produced by this species as figured by Buckton was taken in Connecticut by Dr. Britton. This gall was sent to Dr. Edith M. Patch, of the Maine Agricultural Experiment Station. When received by Dr. Patch the gall was brown and dry. None of the inhabitants were secured for identification. A note recording the occurrence of this gall in Connecticut with a brief description occurs on page 263 of Bull. 220 of the Maine Agricultural Experiment Station. A very good picture of the gall is given in Fig. 139 C of the same bulletin. While the identity of this species may be in doubt, as a matter of record, it may well be included among the species occurring within the United States."

Stamford, and Port Chester, N. Y., 25 Aug., 1913 (W. E. B. and F. A. Bartlett).

E. pyricola Baker and Davidson.

Jour. Agr. Research, vol. vi, 358, 1916.

E. rileyi Thomas. *Eriosoma ulmi* Riley.

Trans. Ill. Hort. Soc., 191, 1877.

This species congregates in flocculent masses on the bark of *Ulmus americana* causing a knotty growth of the affected parts. It is discussed and figured by Patch (1910a).

Hartford, 10 Sept., 1910.

E. ulmi (Linnaeus). *Schizoneura fodiens* Buckton.

Syst. Nat., Edn. 10, 453, 1758.

This species makes the same type of leaf roll on European elms that *E. americanum* does on the American elm. The summer generations occur on the roots of *Ribes*. For account see Tullgren (1909).

Norfolk, 30 June, 1914; Middletown, July, 1914.

Georgia Wilson.

This genus is suggestive of both *Eriosoma* and *Colopha*. The stem mother has the five-jointed antennae of *Eriosoma*. The early summer generations live in pseudo galls on the host plant.

The antennae of the alate generations are six-jointed. The sensoria are narrowly linear, but do not encircle the joints to any extent. The venation of the hind wing is that of the genus *Colopha* in that only the media is present. M of the fore wing is once forked. The cornicles of the alate viviparous females are similar to those of the genus *Eriosoma*. Sexuels unknown.

The genus is represented by but one species *G. ulmi* Wilson.

Tribe **TETRANEURINI** (New Tribe).

This tribe is composed of species which live in true galls produced on the leaves of the winter host. Summer hosts, grasses and herbs so far as known.

Stem mother with four-jointed antennae. Young of stem mother all become winged. Third generation apterous. Wax production not as highly developed as in the tribe Eriosomatini. Wax pore plates similar to those of this tribe. Cornicles present or wanting. Reduced to slightly raised rings. Antennae of alate forms distinctly angular, six-jointed. Sexualls small, beakless; female laying but one egg. This tribe appears to be a connecting link between Eriosomatini and Pemphigini.

Key to Genera.

- | | |
|---------------------------------------|----------------------------|
| 1. Hind wing with one diagonal | 2 |
| Hind wing with two diagonals | <i>Gobiashia</i> , p. 316 |
| 2. Fore wing with M once forked | <i>Colopha</i> , p. 316 |
| Fore wing with M simple | <i>Tetraneura</i> , p. 315 |

Tetraneura Hartig.

This genus possesses some of the characters of both the genus *Eriosoma* and the genus *Pemphigus*.

The stem mother has four-jointed antennae. Wax pore plates wanting or very weakly developed. Young of stem mother all acquiring wings. Third generation apterous.

Alate viviparous females with six-jointed antennae. Secondary sensoria linear, transverse. At least antennal joints iii to v annular.

M of fore wing simple. Hind wing with media only present. (Fig. 28, 6.) Wax pore plates composed of a central area surrounded by a single row of facets. Cornicles present or absent. Cauda short, broadly rounded. Sexualls small and beakless, with four-jointed antennae. Females laying but one egg.

The species of this genus produce true galls upon the leaves of the winter host. Summer generations live on the roots of grasses so far as known.

Key to Species.

- | | |
|---|--------------------|
| Joint v of antennae longer than iv, subequal to iii in length | <i>ulmisacculi</i> |
| Joint v subequal to iv, shorter than iii | <i>graminis</i> |

T. ulmisacculi Patch.

Me. Agr. Expt. Sta., Bull. 181, 216, 1910.

Producing an erect pedunculated gall on the dorsal side of leaf of *Ulmus montana*, *U. pubescens* and *U. campestris*. An account of this insect is given by Patch (1910a). This is close to *T. ulmi* Geoffroy and may prove to be that species though the evidence is somewhat conflicting.

T. graminis Monell. *T. colophoidea* Howard. *T. ulmicola* Gillette.

Can. Ent., xiv, 16, 1882.

Producing a cock'scomb-shaped gall on the dorsal side of leaf of *Ulmus americana* which is the habitat of the spring generations. The summer generations live upon the roots of grass (*Leersia*, *Aira* and *Agrostis*). For a discussion of this species versus *Colopha ulmicola* Fitch see Patch (1910a).

On elm, New Haven, 3 Aug., 1909 (A. I. B.).

Colopha Monell.

This genus has characters suggestive both of *Eriosoma* and *Pemphigus*.

Stem mother with four-jointed antennae. Young of stem mother all acquire wings. Third generation apterous. Antennae five-jointed.

Alate viviparous females with six-jointed, annular antennae. Sensoria narrow, transverse.

Fore wing with M once forked. Hind wing with media only. Sexualls, small and beakless. Antennae four-jointed. Females laying but one egg. *C. ulmicola*, the only species of the genus, produces true galls on the leaves of the winter host. Summer generations produced on roots of grass.

C. ulmicola (Fitch). *Byrsocrypta ulmicola* Fitch. *Colopha eragrostidis* Middleton.

Nox. and Ben. Ins. N. Y., v, 843, 1859.

Forming cock'scomb-like galls on the upper surface of leaves of *Ulmus americana* and migrating to roots of grass for the summer. A discussion of this insect was given by Patch (1910a).

Gobiashia Matsumura.

Like the other genera of the tribe Tetraneurini this one possesses the characters of both *Eriosoma* and *Pemphigus*.

Stem mother with four-jointed antennae. Wax pore plates feebly developed, composed of irregular area without chitinous border. Young of stem mother all acquire wings. Third generation apterous.

Alate forms with six-jointed antennae. Joints annular. Sensoria linear, transverse nearly encircling joints.

Venation of fore wing variable. Colorado material has 47 individuals with M of both fore wings once forked, 101 with M of but one wing forked and 70 with M of both wings simple.

Hind wing always with both media and cubitus present. Wax pores most strongly developed in pupae. These are composed of a central area surrounded by a single row of facets. Sexualls unknown.

G. ulmifusus (Walsh). *Pemphigus ulmifusus* Walsh. *Schizoneura* n. sp. Sanborn (1904, pp. 28-29).

Am. Ent., 1, 109, 1869.

So far as verified records go the spindle-shaped sack-like galls of this aphid are found on *Ulmus pubescens* Walt.

Tribe MELAPHINI.

The members of this tribe are for the most part true gall producers; however, one species spends at least a part of the year on moss. While the tribe suggests both Eriosomatini and Pemphigini it is quite distinct from both. A further knowledge of this tribe may show it to be wrongly placed in the subfamily Pemphiginae.

Both alate and apterous individuals are produced in the galls. In all probability the young of the stem mother are all apterous. Wax production moderately developed. Wax pore plates of apterous individuals variable. Those of the alate forms composed of subcircular facets of irregular size which are loosely arranged. Cornicles lacking. Antennae of alate forms five- or six-jointed. Sexuels unknown.

Melaphis Walsh.

Stem mother unknown. Apterous forms produced in the galls have five- or six-jointed antennae. Wax pore plates variable. Those of the abdomen composed of several irregularly-shaped facets of about equal size. Plates on head and thorax composed of from one to five facets. When consisting of from three to five facets these are arranged into a circular plate.

Alate form with five- or six-jointed antennae. Sensoria broadly linear, nearly encircling joints, or narrowly oval and not encircling the joints. Stigma of fore wing prolonged, pointed beyond the stigmal vein. M of fore wing simple. Hind wing with media and cubitus both present. Wax pore plates on head, prothorax and abdomen composed of subcircular facets loosely arranged.

One species of this genus produces galls on the leaves of the host. The other lives on mosses so far as known.

Key to Species.

- Antennae of alate viviparous females six-jointed. Sensoria broadly linear, nearly encircling joints **rhois**
 Antennae of alate viviparous females five-jointed. Sensoria narrowly oval, not encircling joints **minutus**

M. rhois (Fitch). *Byrsocrypta rhois* Fitch.

Jour. N. Y. Agr. Soc., xvi, 73, 1866.

See Baker (1917j).

M. minutus Baker.

Ent. News, xxx, 194, 1919.

Tribe GEOICIINI (New Tribe).

This tribe is represented by but one genus, *Geoica* Hart and one species *G. squamosa* Hart. It is placed in the subfamily Pemphigini only tentatively. A further knowledge of its one species may necessitate its being placed elsewhere.

Geoica Hart.

Stem mother unknown. Apterous viviparous females with five-jointed antennae. Permanent sensoria with fringe of celia. Cornicles wanting. Anal plate large, prominent. Rudimentary gonopophyses, two.

Alate viviparous females with six-jointed antennae. Abnormal specimens with iii and iv grown together. Sensoria oval to sub-circular; irregular in size. Permanent sensoria with fringe of celia. Fore wing with M simple. Hind wing with both media and cubitus present. Cornicles wanting. Rudimentary gonopophyses, two. Sexuels unknown.

This genus is represented by a single species *G. squamosa* Hart which lives on the roots of grasses and herbs. No aerial generations known.

G. squamosa Hart.

Rept. Ins. Ill., 18, 98, 1894.

This species feeds upon the roots of grasses and herbs. So far as known no aerial generations are produced. The entire body is covered with coarse hairs which are often spatulate. Wax pore plates not developed. Cornicles wanting. Antennae of alate forms normally six-jointed. Frequently abnormal specimens have only five joints. Permanent sensoria with fringe of celia. Rudimentary gonopophyses, two. Sexual forms unknown.

Tribe TRIFIDINI (New Tribe).

The members of this tribe feed upon the roots of herbs and grasses. No aerial generations are known. Body covered with fine, simple hairs. Wax pore plates not developed. Cornicles wanting. Antennae of alate forms normally six-jointed. Permanent sensoria without celia. Rudimentary gonopophyses wanting. Sexuels so far as known, beakless, females laying but one egg. Two genera are placed in this tribe. A further knowledge of these may show them to represent but a single genus. For the present, however, it appears best to retain both.

Key to Genera.

- Media and cubitus of hind wing rising from same point. Apterous viviparous female with five-jointed antennae *Trifidaphis*, p. 319
- Media and cubitus of hind wing with bases remote. Apterous viviparous female with six-jointed antennae *Tullgrenia*, p. 319

Trifidaphis Del Guercio.

Stem mother unknown. Apterous viviparous females with five-jointed antennae. Joint ii longer than i, subequal to iii. Permanent sensoria of all generations without fringe of celia.

Antennae of alate viviparous females six-jointed. Abnormal specimens with five joints. Joints ii longer than i, subequal to iv. Sensoria oval to subcircular. Fore wing with M simple. Hind wing with both media and cubitus present. Their bases united. Cornicles wanting. Sexuels unknown. Species living on roots of grasses and herbs. This genus contains a single species.

T. radicola Essig.

Pom. Jour. Ent., i, 8, 1909.

Tullgrenia van der Goot.

This genus is very similar to *Trifidaphis*, yet it differs from it sufficiently to warrant their separation for the present at least.

Stem mother unknown. Apterous viviparous females with six-jointed antennae. Joint ii longer than i but shorter than iii. Permanent sensoria without fringe of celia. Cornicles and rudimentary gonopophyses wanting. Antennae of alate viviparous females six-jointed. Joint ii longer than i, subequal to iv. Sensoria oval to subcircular. Fore wing with M simple. Hind wing with both media and cubitus present. Their bases remote. Cornicles wanting. Sexuels small, beakless, females laying but one egg.

T. phaseoli Passerini.

Gli. Afdi., 39, 1860.

This is the only species in the genus and feeds upon the roots of beans.

Tribe PEMPHIGINI.

The species of this tribe live exposed on the twigs of the host, within curled leaves or pseudo galls, or within true galls produced upon the leaves or young wood of the winter host. Summer generations produced on roots of trees, herbs and grasses. At least one species produces aerial summer generations on *Cicuta occidentalis*.

Stem mother with four- or five-jointed antennae. Young of stem mother winged or apterous. Wax production highly developed. Wax pore plates composed of many several-sided facets of equal size, closely arranged. Cornicles absent or present. Reduced to slightly raised rings. Antennae of alate form six-jointed. Sexuels small, beakless, female laying but one egg.

Key to Genera.

- | | |
|-------------------------------------|---|
| 1. M of fore wing once forked | 2 |
| M of fore wing simple | 3 |

2. Alate forms with distinct cornicles. Stem mother with marginal wax pore plates only *Pachypappella*, p. 320
- Alate forms without cornicles. Stem mother without wax pore plates *Asiphum*, p. 320
3. Antennal joint iv subequal to or less than one-half the length of iii 4
- Antennal joint iv distinctly greater than one-half of, usually about three-fourths of length of iii *Neoprociphilus*, p. 323
4. Stem mother with five-jointed antennae 5
- Stem mother with four-jointed antennae 7
5. Alate forms with wax pore plates on inner posterior margin of lobes of mesothorax 6
- Alate forms without wax pore plates on inner posterior margin of lobes of mesothorax *Cornaphis*, p. 321
6. Wax pore plates of thorax approximate. Distance between them normally less than greatest diameter of plate. Secondary sensoria with fringe of celia *Prociphilus*, p. 321
- Wax pore plates of thorax remote. Distance between them greater than greatest diameter of plates. Secondary sensoria without fringe of celia *Thecabius*, p. 324
7. Spur of sixth joint of antennae longer than joint *Mordwilkoja*, p. 325
- Spur of sixth joint of antennae shorter than joint *Pemphigus*, p. 326

Pachypappella Baker.

Stem mother with five-jointed antennae. Wax pore plates at margin of abdomen only. Cornicles wanting. Rudimentary gonopophyses, three. Young of stem mother all acquiring wings. Third generation apterous.

Alate viviparous females with six-jointed antennae. M of fore wing once forked. Media and cubitus present in hind wing. Cornicles present; reduced to slightly raised rings. Sexual forms small, beakless; females laying but one egg. Antennae five-jointed.

Asiphum Koch.

Stem mother with five-jointed antennae. Wax pore plates wanting. Body covered with fine hair. Cornicles wanting. Rudimentary gonopophyses, three. Young of stem mother all acquire wings. Third generation apterous.

Alate viviparous females with six-jointed antennae. Sensoria oval. M of fore wing once forked. Both media and cubitus of hind wing present.

Inner posterior margin of lobes of mesothorax with or without wax pore plates. Cornicles wanting. Wax pore plates well-developed in pupae. Composed of many several-sided facets of equal size surrounded by a chitinous ring. Sexuals small, beakless. Antennae five-jointed.

Species living in pseudo galls or folded leaves or in clusters of leaves of winter host, produced by curling of their petioles.

Winter host *Populus* species. Summer hosts unknown.

Key to Species.

1. Mesothorax of alate viviparous females with wax pore plates at inner posterior margin of lateral lobes 2

Mesothorax without wax pore plates at inner posterior margin of lateral lobes **sacculi**
(Fundatrigenia)

2. Venation of fore wing constant. M always once forked. Fork of M long, distance from tip of wing to fork subequal to distance to base of stigmal vein **tremulae**
(Fundatrigenia)

Venation of fore wing variable. M frequently simple. Fork of M short. Distance from tip of wing to fork less than distance to base of stigmal vein **pseudobyrsa**
(Fundatrigenia)

A. pseudobyrsa (Walsh). *Byrsocrypta pseudobyrsa* Walsh.

Proc. Ent. Soc. Phila., I, 306, 1862.

See Gillette (1914b).

On silver poplar, Fairfield, 25 June, 1912 (R. C. Hitchcock).

A. sacculi Gillette.

Ann. Ent. Soc. Amer., vii, 65, 1914.

See Gillette (1914a).

A. tremulae De Geer.

Faun. Suec., 261, 1761.

See Tullgren (1909).

Cornaphis Gillette.

This genus is closely related to *Asiphum* Koch. Stem mother with five-jointed antennae. Wax pore plates absent. Young of stem mother apterous. Wax pore plates composed of many several-sided facets of uniform size surrounded by chitinous ring. Front of apterous females armed with conical tubercle. Third generation (Sexuparae) all acquire wings. Alate viviparous females have six-jointed antennae. Sensoria oval. Fore wing with M simple. Media and cubitus both present in hind wing. Cornicles wanting. Sexuials small, beakless, females laying but one egg. Antennae five-jointed. Stem mother, fundatrigenia (apterous, second generation) and sexuparae (alate viviparous, third generation) all produced in the same galls on leaves of host plant.

C. populi Gillette.

Ann. Ent. Soc. Amer., vi, 491, 1913.

The only species in the genus; produces galls by folding leaves of *Populus angustifoliae*. See Gillette (1913b).

Prociphilus Koch.

Stem mother with five-jointed antennae. Wax pore plates well developed on head, thorax and abdomen. Prothorax with four plates in a transverse row. Central pair frequently confluent.

Young of stem mother all acquiring wings. Third generation apterous. Alate generations with six-jointed antennae. Second-

ary sensoria narrow transverse or broadly oval, surrounded by fringe of cilia.

The mesothorax with two wax pore plates. One on the inner, posterior margin of each lateral lobe. The distance between them usually less than the greatest diameter of the plates; confluent or separated by a straight line only in one species.

Fore wing with M simple. Hind wing with media and cubitus both present. Cornicles wanting. Cauda short, broadly rounded.

Rudimentary gonopophyses, three. Sexualls small and beakless, females laying but one egg. Antennae five-jointed.

Species live in curled leaves; exposed on the twigs or stems, or on the roots of the host plant.

Key to Species.

1. Secondary sensoria on joints iii, iv, v and vi of antennae of alate viviparous females 2
 Secondary sensoria on iii, iv and v only 6
 Secondary sensoria on iii and iv only 7
2. Wax pore plates of prothorax and mesothorax distant 3
 Wax pore plates on prothorax, and mesothorax of alate viviparous females confluent or separated only by a line **approximatus**
3. Normally twelve or less sensoria on iii 4
 Normally more than twelve sensoria on iii 5
4. Joint iv of antennae subequal to front tarsi in length. Small species less than 3 mm. long. Wax pore plates well developed on base of head **fraxinifolii**
 Joint iv of antennae subequal to one-half the length of front tarsi. Large species over 3 mm. long. Wax pore plates poorly developed or wanting on base of head **tessellata**
5. Wax pore plates on mesothorax triangular in form **venafuscus**
 group (Sexuparae)
 Wax pore plates on mesothorax oval in form **corrugatans**
 group (Sexuparae)
6. Secondary sensoria broadly oval to subcircular. Less than ten sensoria on iii **imbricator**
 Secondary sensoria narrowly oval to broadly linear. More than ten on iii **corrugatans**
 group (Fundatrigenia)
7. Wax pore plates on head of alate forms subequal to or larger than those on mesothorax **xylostei**
 (Fundatrigenia)
 Wax pore plates on head of alate forms distinctly smaller than those on mesothorax or entirely wanting **venafuscus**
 group (Fundatrigenia)

The species of this genus are so little known and there is so much confusion in the various collections regarding the naming of some species that it is impossible to formulate a key for the separation of all species. There are two groups for which this holds true. One consists of the species *venafuscus* (Patch), *fraxinidipetalae* (Essig) and *pyri* (Fitch). The other contains the species *corrugatans* and *alnifoliae*.

Specimens labeled *corrugatans* (Sirriner) and *alnifoliae* (Williams) from Maine, Massachusetts, Illinois, Michigan, Colorado

and California show a very gradual gradation from one extreme of size to another and also in the case of other characters. These were taken on apple, haw, *Amelanchier*, *Crataegus*, *Sorbus* and quince. All attempts to separate these by hosts, localities or by structural characters have failed. Therefore, the writer considers for the present, at least, that there is but one, very variable species represented by this group.

Rearing records and a thorough study of the variation within each species will be required in order to determine the validity of the species in question.

***P. approximatus** Patch.

Jour. Econ. Ent., 10, 418, 1917.

On white ash, Hawleyville, 19 June, 1914 (W. E. B.).

P. imbricator (Fitch). *Schizoneura imbricator* Fitch. (Fig. 28, 14.)

Homop. N. Y. St. Cab., 68, 1851.

In woolly colonies on *Fagus*.

On beech, Norwich, 15 Sept., 1910 (E. J. S. Moore); Branford, 16 Sept., 1913 (A. F. Whiting).

P. tessellata (Fitch). *Schizoneura tessellata* Fitch. *Pemphigus acerifolii* Riley. (Pl. viii, 4.)

Homop. N. Y. St. Cab., 68, 1851.

Migrates between *Acer* where it occurs on the ventral side of leaf and *Alnus* where the secretions of flocculent white wax render the colonies conspicuous upon the stem. For an outline of the life cycle see Patch (1911).

On cutleaf maple, Westville, 28 June, 1912 (J. K. L.); on maple, Derby, 28 June, 1915 (W. E. B.); on silver maple, Hartford, 17 July, 1905; on sugar maple, Bethel, 24 June, 1913; on alder, Southbury, 5 June, 1903; on cutleaf alder, New Canaan, 29 Sept., 1909 (A. I. B.); on Japanese maple, North Haven, 2 July, 1909 (J. F. Barnard).

P. venafuscus Patch.

Ent. News, xx, 319, 1909.

A dark winged species developing in flocculent colonies on *Fraxinus*, *Syringa* and *Forsythia* and migrating to the roots of *Abies balsamea*.

P. xylostei De Geer. (Fig. 28, 4.)

Mem. des Ins., iii, 96, 1773.

A flocculent species in colonies on twigs and in crumpled leaves of *Lonicera*. For description and figures see Tullgren (1909). For American record see Patch (1916b).

Neoprociphilus Patch.

Stem mother unknown. Apterous viviparous females with six-jointed antennae. Joints iii, iv, v and vi subequal in length. Wax

pore plates well developed. Composed of many several-sided facets and bordered by a chitinous ring.

Alate viviparous females with six-jointed antennae. Joint iv distinctly greater than one-half of iii, usually about three-fourths the length of iii. Secondary sensoria oval; without fringe of celia. Wax pore plates well developed. Those of abdomen similar to those of apterous forms.

Fore wing with M simple. Media and cubitus both present in hind wing. Cornicles wanting or present.

Sexuals small, beakless, the females laying but one egg. Antennae five-jointed. Species live exposed on stem or twigs of host.

Key to Species.

Secondary sensoria on joints iii, iv and v of antennae. Cornicles wanting **attenuatus**
Secondary sensoria on iii only. Cornicles present in alate forms **aceris**

N. aceris (Monell).

Can. Ent., xiv, 16, 1883.

A flocculent species on the limbs of *Acer*. The peculiar antennae of this and the succeeding species indicate their affiliation.

On sugar maple, New Haven, 15 June, 1910; on maple, Bethel, 23 June, 1913 (R. C. Keeler).

N. attenuatus (Osborn and Serrine).

Proc. Ia. Acad. Sci., i, 100, 1892.

A flocculent species in dense colonies on stem of *Smilax herbacca*. An account of this species with figures is given by Patch (1912).

Thecabius Koch.

Stem mother with five-jointed antennae. Wax pore plates on head, thorax and abdomen. Prothorax with six plates. The central four in the form of a trapezoid. The forward pair smallest and closest together. Cornicles wanting. Young of stem mother all acquire wings. Third generation apterous.

Antennae of alate viviparous females six-jointed. Secondary sensoria broadly linear to narrowly oval, transverse, not fringed with celia. Wax pore plates on mesothorax distant. Distance between them greater than greatest diameter of plates. M of fore wing simple. Hind wing with media and cubitus both present. Rudimentary gonopophyses, three. Cornicles wanting.

Sexuals small, beakless and with antennae five-jointed. Females lay but one egg. The species of this genus produce pseudo galls on leaves of winter host. Summer hosts, trees and herbs so far as known.

Key to Species.

1. Antennal joint vi and frequently v also, without secondary sensoria 2
Antennal joints iii to vi with secondary sensoria **populi-conduplicifolius**
(Fundatrigenia)

2. Secondary sensoria nearly uniform in shape. Joint vi longer than v 3
 Secondary sensoria irregular in form, crowded. Joint vi distinctly
 shorter than v **gravicornis**
 (Fundatrigenia)
3. Antennal joint v subequal to one-half the length of front tarsi.
 Sensoria narrowly oval, distinctly raised above surface of joint
 **populi-monilis**
 (Fundatrigenia)
- Antennal joint v subequal to length of front tarsi. Sensoria linear
 or broadly linear, but slightly raised above surface of joint
 **populi-conduplifolius**
 (Sexuparae)

T. gravicornis (Patch). *Pemphigus gravicornis* Patch.

Me. Agr. Expt. Sta., Bull. 213, 75, 1913.

Host plant *Populus balsamifera*. The affected leaves are folded lengthwise along the midrib and their margins are applied together at their ventral surfaces,—the whole leaf swollen into a pouch filled with aphids. The characteristic antenna of the alate female serves to distinguish this from all other known species. For description and figures see Patch (1913).

T. populi-conduplifolius Cowen.

While the stem mothers of this species and *T. patchii* Gillette appear to have different habits positive evidence of the fact seems to be lacking. A comparison of the alate forms of these species does not reveal any constant differences which would warrant their separation, therefore, the writer considers *patchii* a synonym of *populi-conduplifolius*.

On balsam poplar, Mystic, 20 June, 1911 (A. L. Beebe).

Mordwilkoja Del Guercio.

Stem mother with four-jointed antennae. Wax pore plates not developed on head, present on thorax and abdomen. Prothorax with four plates in transverse row. Young of stem mother all acquire wings.

Alate viviparous females with six-jointed antennae. Spur of sixth segment longer than joint and bearing several small oval sensoria. Secondary sensoria broadly linear to narrowly oval, transverse. Mesothorax with or without wax pore plates. Fore wing with M simple. Hind wing with media and cubitus present. Cornicles present, weakly developed. Rudimentary gonopophyses, three. Sexuels unknown.

M. vagabundus (Walsh). *Byrsocrypta vagabunda* Walsh.
 (Pl. xi, 1.)

Proc. Ent. Soc. Phila., i, 306, 1862.

The only species of this genus produces large galls, composed of an entire leaf, on *Populus occidentalis* which is the winter host. Summer host not known. This species can be separated from any other Pemphigid by the long spur on the sixth segment of the antennae.

Pemphigus Hartig.

Antennae of stem mother four-jointed. Wax pore plates not developed on head; present on thorax and abdomen. Prothorax with four plates in a transverse row. Young of stem mother acquire wings; third generation apterous. Alate viviparous females with six-jointed antennae. Mesothorax of fundatrigeniae usually without wax pore plates. Sexuparae always with such wax pore plates.

Fore wing with M simple. Hind wing with media and cubitus well developed. Cornicles normally wanting. Rudimentary gonopophyses, three. Sexuials small, beakless, females laying but one egg. Antennae four-jointed. Stem mother and second generation only occupying galls. Gall production is highly developed in this genus. The species produce galls on the leaves, leaf petioles and young wood of the winter host. Summer generations live on the roots of grasses and herbs. One species only produces aerial colonies on the summer host.

The characters available for the determination of the species of this genus are so variable and several of the species are apparently so closely related that their separation is extremely difficult. Certain relative proportions appear to hold and serve as a means of separating these closely related species.

These relative proportions are what the writer terms the coefficient of antennal joint vi determined by the following formula:

$$\frac{\text{Length of vi} + \text{spur}}{\text{length of iii}}$$

and the antennal coefficient which is found as follows:

$$\frac{\text{Length of iii} + \text{iv} + \text{v} + \text{vi} + \text{spur}}{\text{length of hind tibia}}$$

These coefficients are used in the following key. The species *P. populivenae* is placed in the key tentatively. In certain collections made the writer finds a species which produces galls such as Fitch describes for *P. populivenae*. This material combines the characters of both *P. populicaulis* and *P. populiglobuli*. Further study is needed to determine the validity of this species.

Key to Species.

1. Greatest diameter of joint iv of antennae not distinctly less than that of v 2
- Greatest diameter of joint iv of antennae distinctly less than that of v. A large, irregular-shaped sensorium on distal one-half of v and vi. Normally the membrane of these sensoria bear small islands of chitin, each bearing one to several hairs *populi-transversus* (Fundatrigenia)

2. Joint vi always with annular sensoria 3
 Joint vi without annular sensoria. Distal sensoria irregular in form, its membrane bearing islands of chitin **populi-transversus** (Sexuparae)
3. Combined length of iii, iv, v and vi equal to or less than that of hind tibia. Less than fifteen sensoria on iii. V usually shorter than vi 4
 Combined length of antennal joints iii, iv, v and vi greater than that of hind tibia. More than fifteen sensoria on iii. Usually about twenty. V and vi subequal **longicornus** n. sp. (Fundatrigenia)
4. Joint iv of antennae with from one to three, rarely four, sensoria. More than 60% with less than four 5
 Joint iv of antennae with variable number of sensoria. Less than 60% with less than four 6
5. Antennal coefficient less than coefficient of vi **populi-globuli** (Fundatrigenia)
 Antennal coefficient greater than coefficient of vi **populi-venae** (Fundatrigenia)
6. Joint v of antennae with from five to seven sensoria. Most frequent member six **bursarius** (Fundatrigenia)
 Joint v of antennae with two to six sensoria most frequent number three to five **populi-caulis** (Fundatrigenia)

P. bursarius (Linnaeus).

Syst. Nat., Edn. 10, 453, 1758.

P. populi-caulis Fitch. (Pl. xi, 2.)

Nox. and Ben. Ins. N. Y., v, 845, 1859.

Hartford, 11 July, 1904; on poplar, Farmington, 11 Aug., 1909 (W. E. B.).

P. populi-globuli Fitch.

Nox. and Ben. Ins. N. Y., v, 850, 1859.

P. populi-transversus Riley.

Bull. U. S. Geol. Geog. Surv. Terr., v, 15, 1879.

P. populi-venae Fitch.

Nox. and Ben. Ins. N. Y., v, 851, 1859.

P. longicornus Maxson, n. sp.

Stem mother about 2.088 mm. x 1.827 mm. Color pale, yellowish white. Wax pore plates normally arranged for the genus; variable in size. Those at margin and on posterior segments of abdomen largest.

Antennae .486 mm. long. Fourth joint distinctly imbricated. Sensoria at distal end of iii and iv oval, fringed with celia.

Length of segments as follows: i, .069 mm.; ii, 0.69 mm.; iii, .208 mm.; iv, .139 mm. Length of front femora, .356 mm.; tibiae, .295 mm.; tarsi, .104 mm. Length of posterior femora, .487 mm.; tibiae, .435 mm.; tarsi, .139 mm.

Alate (second generation) viviparous females when freshly removed from galls have the abdomen a creamy yellow, thorax and head dark, almost black, with a bluish tinge. Legs and antennae

dusky. Antennae long reaching to posterior margin of meta-thorax. Cornicles usually present, weakly developed.

Joint i, .043 mm.; ii, .069 mm.; iii, 3.435 mm.; iv, .139 mm.; v, .174 mm. and vi + spur, .191 mm.

Base of joint iii usually slightly swollen for a short distance. Sensoria on iii, 20-25; iv, 6-8; v, 8-10; vi, 8-10. Sensoria nearly or entirely encircling joints.

The galls are quite similar in form to those produced by *Tetraneura graminis* only less notched at top and less ribbed on sides. Walls thin. Length of large galls about five-eighths inch, height about one-half inch. From side to side they measure about three-sixteenths inch. Slightly constricted where attached to leaf. Placed on upper side of leaves of *Populus deltoides*.

Type locality: College Station, Texas.

Dr. A. C. Baker who has had this species in manuscript offers the following data:

1. Collected by T. A. Williams, Lincoln, Neb., 1891. Host plant not given.
2. Collected by Theo. Pergande, on the Potomac flats near Chain Bridge, D. C., May 25, 1905. Each gall contained at this date only stem mother and young larvae. From June 8 to 16 migrants were obtained.
3. Collected by Chas. E. Sanborn, College Station, Texas, April 26, 1906, on cottonwood. Galls contained stem mothers, pupae and migrants.
4. Collected by T. H. Jones, Baton Rouge, La., June 4, 1919, on poplar.

Subfamily MINDARINAE.

Mindarus Koch.

M. abietinus Koch. (Fig. 28, 5.) *Schizoneura pinicola* Thomas. Die Pflanz. Aphid, 278, 1857.

For figures and account of work on *Picea* and *Abies* see Patch (1910b and 1911b).

Subfamily HORMAPHIDINAE.

Hormaphis Osten Sacken.

H. hamamelidis (Fitch). *Brysocrypta hamamelidis* Fitch. (Pl. xi, 4.)

Homop. N. Y. St. Cab., 69, 1851.

Developing in conical galls on leaves of *Hamamelis virginiana* and migrating to *Betula*. For life history and figures see Pergande (1901).

On witchhazel, Meriden, 24 July, 1909 (A. I. B.).

Hamamelistes Shimer.

H. spinosus Shimer. *Hormaphis papyraceae* Oestlund. (Pl. xi. 3.) (Fig. 28, 7.)

Trans. Am. Ent. Soc., i, 284, 1867.

Migrating between *Hamamelis virginiana* and *Betula* causing a spiny gall on the twigs of the former and corrugating the leaves of the latter. For life history and figures see Pergande (1901).

On white birch, New Haven, 10 July, 1909 (A. I. B.); on cutleaf white birch, New Haven, 8 June, 1911 (W. E. B.); on birch, Killingly, 11 June, 1915 (W. E. B.); on *Hamamelis virginiana*, New Haven, 27 Oct., 1915 (B. H. W.).

Family CHERMESIDAE.

Chermes Linnaeus.

Key to Species.

1. Gall form on *Picea* 2
Developing on trunk of *Pinus strobus*, covered with white secretion
pinicorticis
2. Gall well formed 3
Presence causing a scraggly deformation of twig—not well formed
gall. Winged form from gall ovipositing on *Picea* similis
3. Large gall on *Picea engelmanni* introduced from the west cooleyi
Gall terminal 4
Gall not terminal, pineapple-shaped 5
4. Gall cone-like, gall leaves modified to thin scales. On *Picea
mariana* and *rubra*. Winged form from gall ovipositing on
needles of *Pinus strobus* pinifoliae
Gall small, compact, about one-half inch long; pink or pale green
when fresh. Gall leaves short. On *Picea mariana* and *P. rubra*.
Winged form from gall ovipositing on *Larix* strobilobius
consolidatus
Gall loose in structure, three-fourths to one and three-fourths
inches long. Gall leaves not much abbreviated. On *Picea
mariana* and *P. rubra*. Winged form from gall ovipositing on
Pinus strobus floccus
5. Fore wing with anal vein not strongly curved; hind wing with M
directed distad. (Fig. 28, 8.) Winged form from gall ovi-
positing on *Larix* lariciatus
Fore wing with anal vein strongly curved; hind wing with M not
directed distad. Winged form from gall ovipositing on *Picea abietis*

For descriptions and figures of these insects and their work the reader is referred to Gillette (1907), Börner (1908), Patch (1909b) and Cholodkovsky (1915).

C. abietis Linnaeus. Spruce gall aphid. (Pl. xi, 7.)

Syst. Nat. Edn. 10, 454, 1758.

Common "pineapple gall" of white and Norway spruce.

New Haven, 10 Sept., 1903; 25 July, 1905, 5 July, 1906, 25 June, 1907, 5 Oct., 1909. Stamford, 3 Oct., 1903; Pomfret Center, 9, 15 June, 1904; Bristol, 6 June, 1906; South Woodstock, 19 June, 1906; New London, 21 May, 1907, 21 June, 1911; Waterbury, 12 Apr., 1910; Orange, 7 June, 1910; Niantic, 10 June, 1910, 11 July, 1910; New Canaan, 22 June, 1910, 1 Aug., 1911, 9 July, 1912; Greenwich, 6 July, 1910, 13 June, 1913; South Manchester, 18 May, 1911; Yalesville, 10 Aug., 1911, 18 Sept., 1913; Milford, 11 Sept., 1911; Glastonbury, 17 Sept., 1912; New Britain, 22 Mar., 1913; Southington, 16 Apr., 1914; Norfolk, 12 June, 1915.

C. cooleyi Gillette. (Pl. xi, 6.)

Proc. Acad. Nat. Sci. Phila., 3, 1907.

New Haven, 6, 10 Aug., 1917, Aug., Sept., 1919; Branford, 28 Sept., 1916; Norwalk, 12 Sept., 1917; New Canaan, Aug., Sept., 1912.

C. floccus Patch.

Psyche, xvi, 137, 1909.

C. lariciatus Patch.

Psyche, xvi, 137, 1909.

C. pinicorticis (Fitch). *Coccus pinicorticis* Fitch. *Chermes pinifoliae* Shimer *not* Fitch. Pine bark aphid. (Pl. viii, 5.)

Nox. and Ben. Ins. N. Y., i, 167, 1855.

On trunk of white pine in flocculent masses.

New Haven, 8 May, 1907; Middletown, 11 June, 1907; Greenwich, 4 Oct., 1911; Sharon, 6 July, 1912; Saugatuck, 14 Oct., 1912; Middletown, 28 May, 1912; Greenwich, 13 June, 1913; Danbury, 6 June, 1914; Riverside, 22 June, 1915; Deep River, 13, 14 July, 1915; Rainbow, 3 June, 1914 (B. H. W.).

C. pinifoliae Fitch. *C. abieticolens* Thomas.

Nox. and Ben. Ins. N. Y., iv, 741, 1858.

On pine, Middletown, 22 June, 1911; black spruce, Stamford, 11 July, 1913.

C. similis Gillette.

Proc. Acad. Nat. Sci. Phila., 15, 1907.

C. strobilobius Kaltenbach. *C. consolidatus* Patch? (Pl. viii, 6.)

Mon. der Pflanz., 203, 1843.

On larch, Middletown, 25 June, 1907; on spruce, New Haven, 10 June, 1904 (B. H. W.).

Phylloxera Boyer.

(Fig. 28, 10.)

Key to Species.

1. Developing on *Carya* 2
 Developing on *Castanea* *castaneae*
 Developing on *Vitis* *vitifoliae*
2. Developing in globular gall on young twig, petiole or midrib of leaf
 *caryaecaulis*
 Developing in thin paper-like gall on leaf *foveola*

For literature on *Phylloxera* see Pergande (1903).**P. caryaecaulis** Fitch. Hickory gail aphid. (Pl. xi, 5.)

Nox. and Ben. Ins. N. Y., i, 155, 1855.

On hickory, New Preston, 8 June, 1903; Norwalk, 21 June, 1904; 28 June, 1912; Hartford, 6 June, 1906, 15 June, 1909; Collinsville, 24 June, 1908; New Haven, 14 June, 1909, 8 Apr., 1914; New Britain, 28 June, 1910; Winsted, 16 June, 1911; Salisbury, 22 June, 1912; Stamford, 3 June, 1913; Glastonbury, 11 June, 1914; Waterbury, 16 June, 1914; Sharon, 29 June, 1914; Bristol, 9 Sept., 1915.

P. castaneae (Haldeman). : *Chermes castaneae* Haldeman.

Am. Jour. Sci., ix, Ser. 2, 108, 1850.

New Haven, 11 Aug., 1910 (S. N. Spring).

P. foveola Pergande.

Proc. Dav. Acad. Sci., ix, 200, 1904.

On hickory, Greenwich, 12 Aug., 1909.

P. vitifoliae Fitch. *vastatrix* Planchon.

Nox. and Ben. Ins. N. Y., i, 158, 1855.

On grape, Westport, 25 Aug., 1905.

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Family ALEYRODIDAE.

By WILTON EVERETT BRITTON, PH.D.

The insects belonging to this family are small, 3 mm. or less in length, wings and body opaque, our species whitish, more or less mealy, the wings in some species marked with dark spots or bands; tarsi of two joints, nearly equal, a spine-like or pad-shaped process (paronychium) between the claws. Pupa stage present in both sexes.

Egg, nymphs, pupae and adults are found on the under side of the leaves of various plants, a few species being important pests. The tropics furnish by far the greatest number of species, many of which are carried on plants into northern greenhouses.

Only about a dozen species are known to occur out of doors in the northeastern United States. Formerly all of our species were placed in the genus *Aleyrodes* but recently this genus has been subdivided and Dr. A. L. Quaintance and Dr. A. C. Baker of the Bureau of Entomology, Washington, D. C., who are leading authorities in this group, have recently published a comprehensive review of the family.* Free use has been made of their work and their classification has been adopted in the preparation of this paper. Explanation of structures is shown in Fig. 32.

Key to Genera.

1. Fore wing of adult without radius, 2
Fore wing of adult with radius, present as a distinct vein
Aleurochiton, p. 336
2. Pupa case with dorsal disk not separated from the submarginal area 3
Pupa case with dorsal disk separated from submarginal area by a suture-like line or depression; submarginal papillae lacking; dorsum without large mammiform pores; vasiform orifice rounded or cordate, elevated and not surrounded by a lobed or palmate area Tetraleurodes, p. 337
3. Vasiform orifice subcordate with anterior margin straight; lingula projecting beyond operculum, and bearing a pair of spines; thoracic tracheal folds not evident; wax secretion if present usually in the form of long glassy rods 4
Vasiform orifice subcircular; operculum nearly filling orifice; lingula not projecting; thoracic tracheal folds ending in a comb of teeth; wax secretion tufted and plume-like arising from minute pores Aleuroplatus, p. 338
4. Pupa case with a submarginal row of papilla-like pores; lingula lobed* Trialeurodes, p. 339
Pupa case without a submarginal row of papilla-like pores; lingula not lobed Aleyrodes, p. 344

* Technical Series No. 27, Parts I and II, Bureau of Entomology, U. S. Department of Agriculture.

Aleurochiton Tullgren.

Fore wing having radius₁, radial sector and cubitus present; vertex rounded; antennae with seven segments, the third being longest; paronychium large and hairy. Pupa case without compound pores, dorsum crowded with simple pores; vasiform orifice surrounded by a differentiated area, lingula setose, not projecting. Only one species occurs in the United States and this is found in Connecticut.

A. forbesii (Ashmead). *Aleurodes aceris* Forbes, preoccupied by *aceris* Geoffroy, an European species.

Rept. Ins. Ill., xiv, 110, 1884.

Pupa case about 1.5 x 1 mm. in size, oval to oblong in shape, broadest posteriorly, considerably raised above surface of the leaf.

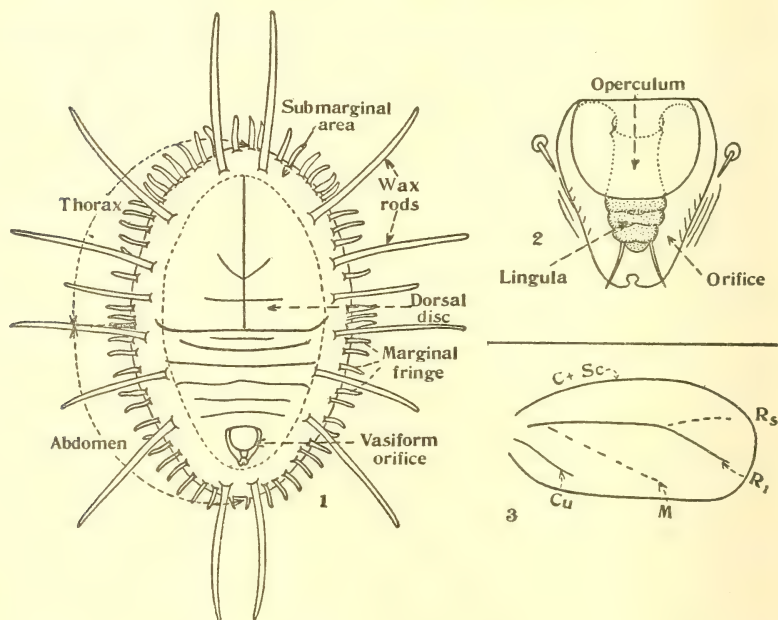


FIG. 32. Aleyrodid structures. (1) *Trialeurodes coryli* Britton,—pupa case. (2) Vasiform orifice of same, greatly enlarged. (3) An Aleyrodid wing showing venation. Greatly enlarged. Drawing by Dr. Philip Garman.

Varies in color from light yellowish green with purplish markings in early summer to purple or chocolate with green or whitish spots or blotches near the margin in autumn. Dorsum flat, devoid of wax rods, with three pairs of spines at caudal margin. Vasiform orifice, cordate, longer than wide; lingula spatulate, not lobed.

setose, not projecting, and bearing a pair of spines at the distal extremity.

Adult female, length measurements*; head and body about 1.5 mm.; fore wing, 1.7 mm.; hind tibia, .66 mm.; basal tarsal joint, .15 mm.; distal tarsal joint, .107 mm.; antenna, .42 mm.; third joint, .16 mm.; fourth to seventh joints, inclusive, .2 mm. Compound eye reniform with large ocellus close to its upper margin. Paronychium, longer than claws, blade-like, and fringed with hairs on lower edge. Color of body yellow with antennae and legs paler; wings white, immaculate.

Male much like female though smaller.

This species is not abundant in Connecticut, usually only one or two larvae or pupae being found on a leaf. It occurs on red maple, *Acer rubrum*, silver maple, *A. saccharinum* (formerly *dasy carpum*) and occasionally on Norway maple, *A. platanoides*.

New Haven, 20 Sept., 1904, 8 Sept., 1905; New Canaan, 15 Sept., 1905 (W. E. B.).

Tetraleurodes Cockerell.

(*Aleyrodes* in part.)

Pupa case varying in size, broadly oval, usually black. Margin with teeth, wax tubes well developed; submarginal area differentiated from dorsal disk and fluted; dorsum without papillae though often with minute pores; reniform "eye spots," often apparent on anterior portion; tracheal folds not evident; wax secretion in the form of a long white fringe around margin. Vasiform orifice small, subcordate or rounded, usually elevated on a tubercle-like projection of the dorsum; operculum of similar shape, almost filling the orifice; lingula not evident. Adult has one flexure in radial sector of fore wing and no trace of media; our species with clouded wings. Antennae of seven segments, the third being longest.

Key to Species.

Pupa case black, surrounded by a white fringe of wax. Adults
with clouded wings. Body bright yellow**mori**
Body white with black markings**mori var. maculata**

T. mori (Quaintance). *Aleyrodes mori*.

Can. Ent., xxxi, i, 1899.

Pupa case about .70 x .55 mm., elliptical, shiny black or dark brown, fringed with white wax rods, ragged at outer margin; margin crenulate, rim marked with minute dots. Dorsal disk slightly raised, thoracic and abdominal segments distinct; a pair of setae occur on both the mesothorax and metathorax; a pair near the vasiform orifice, a pair near the caudal margin, and a

* These measurements were made by Quaintance and Baker, and published in Technical Series, No. 27, page 90, Bureau of Entomology, U. S. Dept. of Agriculture.

pair of minute setae on the caudo-lateral margin. Vasiform orifice small, elevated, subelliptical, wider than long; operculum nearly filling orifice, cephalic margin straight, lateral and caudal margins parallel with those of orifice. Lingula short, not reaching margin of operculum.

Adult female: Length about .8 mm.; fore wing .83 x .30 mm. Color bright yellow, wings reddish at margins, fore wings spotted with bright red and brownish-black; two irregular red spots near proximal third, one each side of vein, and three or four brown spots at distal fourth, one each side of vein, one proximad and one distad of the last two. Antennae of seven segments, the third slightly longer than the distal four together.

Male marked like female though smaller.

Dr. E. P. Felt records this species from Mt. Kisco, N. Y., on mountain laurel, *Kalmia latifolia*.

T. mori var. **maculata** (Morrill). *Aleyrodcs mori* var. *maculata*.

Psyche, x, 81, 1903.

Pupa case as above. Fore wings clouded with red and brownish black. Head, thorax and abdomen white, marked with black as follows: "a transverse band across front of head, between bases of antennae; a more or less distinct dark spot on each side just above the eye; a roundish black spot on each side of prothorax just below the dorsum; a more or less elliptical black spot covering a nearly equal area on each side of mesothorax, in front of and below the insertion of fore wings—these last two pairs of spots together occupying a space on each side of the body about equal in size to one of the dumb-bell-shaped compound eyes; an elongated spot on dorsum of mesothorax on each side in front of insertion of fore wing—these spots are oblique converging posteriorly; a smaller spot on each side of dorsum of metathorax posteriorly; a transverse spot on dorsum of abdomen just anterior to vasiform orifice; and a border along the posterior margin of the operculum." Morrill.

Fairly common on ash, birch, mulberry, *Cornus florida* and *C. sanguinea* in Massachusetts.

Larvae and pupae cases of *mori* or its variety have been taken in Connecticut on catalpa, linden, ash, hackberry, hornbeam, hazel and box elder, but the adults were not obtained. The records are as follows:

New Haven, 22 July, 1904 (W. E. B., B. H. W.); 20 Sept., 1904, 2 Sept., 1914; Stamford, 17 Aug., 1912; 5 Aug., 1913 (W. E. B.); Danbury, 2 Sept., 1914 (H. H. Kellner).

Aleuroplatus Quaintance and Baker.

Pupa case slightly convex, oval to subcircular in outline, and ranging from medium to large in size; color often dark brown or black; margins toothed; submarginal area not separated from

dorsal disk; dorsum without prominent pores or papillae but often with numerous minute pores; wax secretion in pencils or tufts, often plume-like and decorative; vasiform orifice small and nearly circular.

Only one species has been found in Connecticut.

A. plumosus (Quaintance) *Aleurodes plumosa*. Plate xii, 3.

Technical Series No. 8, Division of Entomology, U. S. Dept. Agr., page 33, 1900.

Pupa case about .86 x .55 mm. broadly oval, narrowed and somewhat pointed cephalad, and broadly rounded caudad; slightly convex, dark brown or black, with copious, white wax secretions arising from minute pores on dorsal disk and submarginal area, forming plumes or tufts; those of margin usually bending outward, those of dorsum standing upright (see Plate xii, 3). Thoracic tracheal comb distinct, composed usually of four teeth; margin of shallow rounded teeth with suture-like markings extending inward. Vasiform orifice subcircular, somewhat flattened at base and measuring about $56\mu \times 50\mu$; operculum subtriangular and filling half to two-thirds of the orifice; lingula rudimentary not projecting beyond operculum.

Adult female: Length about .86 mm.; fore wing about .91 x .38 mm., white, immaculate. Legs and body uniformly yellow, more or less covered with wax secretion. Eyes reddish brown, constricted. Third antennal segment about equaling in length the fourth, fifth, sixth and seventh combined.

Male, similar in general appearance though slightly smaller.

Host, checkerberry or creeping wintergreen, *Gaultheria procumbens*.

Haddam, June, 1918, 27 June, 1920 (W. E. B.).

Trialeurodes Cockerell.

Asterochiton Quaintance and Baker.

(*Aleyrodes* in part.)

Pupa case elliptic, small to medium in size, color varying from whitish to dark brown; margin toothed with wax tubes moderately developed; submarginal area not differentiated from dorsal disk; the former with large papillae or pores; thoracic tracheal folds rarely distinguishable; usually a distinct furrow connecting vasiform orifice with caudal margin; wax secretion appears in form of brittle, white, glassy rods from dorsal pores, and a palisade of white wax elevating the case from the leaf. Vasiform orifice subcordate, usually with a notch at caudal end; operculum about half filling the orifice, transversely elliptic; lingula exposed, lobed, and usually with a pair of distal hairs or spines.

Adult with one flexure in radial sector of fore wing; no trace of media except in freshly emerged specimens. Antennae of

seven imbricated segments, third the longest, fourth to sixth subequal.

Key to Species.

1. Pupa case with both dorsal and marginal wax rods; adults with immaculate wings 2
Pupa case without dorsal wax rods 5
2. Pupa case with large wax rods borne on dorsum 3
Pupa case with all wax rods arising near margin, though often curving over dorsum *packardi*
3. Pupa case with pair of large wax rods on each of the three thoracic, and on six of the abdominal segments, two pairs at cephalic, and one pair at caudal extremities *waldeni*
Pupa case, with pair of large dorsal wax rods on each of the three thoracic segments, three pairs on abdomen, and one pair at each of the cephalic and caudal extremities *coryli*
Pupa case with three pairs of large dorsal wax rods in front of the mesothorax, one pair near base of abdomen, one pair nearly opposite vasiform orifice *vaporariorum*
5. Pupa case with small marginal wax rods; adults with maculated wings *abutilonea*
Pupa case without marginal wax rods; adults with immaculate wings *morrilli*

T. abutilonea (Haldeman). *Aleyrodes abutilonea*, *Aleyrodes fitchi* Quaintance.

Am. Jour. Sci. Arts, ix, 108, 1850.

Pupa case about .7 x .43 mm., elliptical; dorsal disk varies from dark brown or smoky black to whitish. Margins whitish; dorsum nearly flat, medio-longitudinal portion slightly ridged or keeled. A submarginal row or series of short and blunt papillae give rise to rather short, more or less curved, glassy, wax rods which form a narrow fringe. On each side there is a subdorsal series of very minute circular transparent spots, and along each side of keel a row of irregular depressions; there is a pair of well developed setae just inside the caudal margin, a smaller pair at vasiform orifice, and sometimes a pair of small setae on cephalic segment and on first abdominal segment. Vasiform orifice subcordate, ending in two rounded lobes appearing as though truncate; operculum sub-elliptical, broader than long, and about half as long as orifice; lingula lobed, distal four-fifths setose, armed with a pair of setae, about three-fourths as long as orifice. A narrow furrow extends from orifice to caudal margin.

Adult female, about .84 mm. long, fore wing about 1.07 x .49 mm., yellow, frons deep brownish black; antennae and legs paler; eyes deep red, constricted at the middle; wings marked with two irregular bands of reddish brown, the proximal band crossing the wing near its middle, appearing in front of the vein, as an irregular rhomboid, and back of it, an irregularly V-shaped spot, the apex of the V being distad; the distal band crosses the wing at its widest point. A reddish brown spot occurs at base of wing just back of the veins, and a similar colored strip extends

along the main vein from the caudal flexure to its distal extremity, ending in an enlarged spot. Antennae of seven segments, the third four-fifths as long as the distal four together.

Male marked like female, though smaller.

Hosts: *Abutilon* and cotton.

Described from Pennsylvania, and recorded from Washington, D. C., Alabama, Texas and Mississippi. Has not been recorded from Connecticut.

***T. coryli** (Britton). *Aleyrodes coryli*. (Pl. xii, 1.) (Fig. 32.)

Ent. News, xviii, 337, 1907.

Pupa case broadly oval, about .70 x .42 mm., slightly constricted before the middle, light greenish yellow, dorsum nearly flat, slightly convex, furrowed transversely according to segmentation, marginal area radially and deeply corrugated or wrinkled, margin finely crenulate. Six pairs of straight or slightly curved upright wax rods from $200\ \mu$ to $230\ \mu$ long are borne upon the marginal area of the dorsum; one pair each at cephalic and caudal extremities, the other four pairs nearly equidistant from each other and slightly nearer to the cephalic than to the caudal pair. Two other pairs of slightly shorter rods occur on the disk of the dorsum, one pair on metathoracic segment just in front of the transverse splitting line, each rod being about half-way between the margin and the center, and the other pair is similarly located on the fifth abdominal segment. There is a submarginal fringe of smaller (about $90\ \mu$ long) curved wax rods rising upward and then curving outward. Vasiform orifice, subtriangular with angles rounded and sides bulging. Operculum semicircular, five-sevenths as long as broad, reaching half the length of the orifice, base nearly a straight line, apex broadly rounded. Lingula spatulate, irregularly seven-lobed, three lobes on each side with the terminal lobe between two setae which are about $16\ \mu$ long. Lobes minutely and densely papillose.

Adult female: Length about 1.15 mm., fore wing about 1. x .38 mm., white, immaculate; legs and body yellow; eyes constricted but not divided. Male somewhat smaller.

Hosts: Hazel, *Corylus americana* and *C. rostrata*, and high bush blackberry, *Rubus nigrobaccus*.

Poquonock, Windsor, July, 1903, 12 Sept., 1904 (W. E. B.); 18 July, 12 Aug., 1904 (B. H. W.); New Haven, 5 Aug., 1904, 14 Aug., 1906, 2 Sept., 1914; Woodbridge, 25 Aug., 1906 (W. E. B.); Scotland, 1 Aug., 1904 (B. H. W.).

***T. morrilli** (Britton). *Aleyrodes morrilli*. (Pl. xii, 2.)

Ent. News, xviii, 340, 1907.

Pupa case about .76 x .48 mm., light greenish yellow; vasiform orifice darker; broadly oval, with a slight constriction or narrowing at cephalic third; dorsum flat or very slightly convex, marked according to segmentation, with a coriaceous, granular, or more or

less wrinkled appearance; without spines, rods, or any form of wax secretions; margin finely crenulate, without wax fringe. Vasiform orifice subtriangular, with angles rounded, about four-fifths as broad as long; operculum semicircular, slightly broader than long and reaching nearly half the length of the orifice; lingula rather coarsely papillose for nearly its entire length, irregularly seven-lobed, the terminal lobe projecting between two spines or setae which are about 16μ long.

Adult female about .86 mm. long; fore wing about $1.34 \times .54$ mm., white, immaculate; body, legs, head and antennae, pale yellow; eyes strongly constricted but not divided. Entire surface of body and wings covered with a mealy secretion of wax. Male resembles female, though smaller.

Host: Jewel weed, *Impatiens fulva*.

Poquonock, Windsor, 12 Sept., 1904; New Haven, 17 Sept., 1904; New Canaan, 5 Oct., 1904; Woodbridge, 28 July, 1905 (W. E. B.).

T. packardi (Morrill). *Aleyrodes packardi*. Strawberry White Fly.

Can. Ent., xxxv, 25, 1903.

Pupa case, about $.80 \times .46$ mm., broadly elliptical greenish yellow, the margin finely crenulate; dorsum nearly flat, rugose; segmentation fairly distinct; no lateral wax rods and no wax rods on disk of dorsum; two submarginal rows of wax rods, the outer radiating, variable in length, but never exceeding three-fourths the breadth of the dorsum; the inner series of rods are also variable in length, rarely exceeding the breadth of the dorsum, and are curved upward over it. Vasiform orifice subtriangular, corners rounded, longer than broad, bounded laterally by chitinous ridges. Operculum has the form of half an ellipse (cut through the shortest axis) reaching a trifle more than half the length of the orifice; lingula with apical lobe between two spines, and three pairs of lateral lobes, densely covered with minute setae in longitudinal rows. A shallow furrow reaches from orifice to caudal margin.

Adult female about 1.17 mm. long; fore wing about $1. \times .5$ mm., immaculate, abdomen pale yellow, head, thorax, legs and antennae pale buff, tip of rostrum black, covered with white flour-like or mealy wax secretion. Male like female though smaller.

This was formerly confused with the following species and occasionally infests strawberries to such an extent as to cause distinct injury.

Hosts: Strawberry, ash, Camperdown elm, *Spiraea*.

West Hartford, 30 June, 1905 (W. E. B.); Branford, 5 Sept., 1914 (John W. Barron).

T. vaporariorum (Westwood). *Aleyrodes vaporariorum*. *A. nicotianae* Maskell. *A. papillifer* Maskell. *A. lecanioides* Maskell. Greenhouse White Fly. (Pl. xii, 5 and 6.)

Gardeners Chronicle, 852, 1856.

Pupa case about .70 x .50 mm., light greenish yellow, dorsum somewhat convex, rugose, segmentation evident; dorsal wax secretion in the form of two series of submarginal wax rods, the outer series forming a marginal fringe consisting of from fifty to seventy-five rods whose length is usually less than one-fifth the breadth of the dorsum, usually curving downward over the margin; the inner series is composed of rods five to ten times as long as the outer ones, usually directed upward and curved over the dorsum, three on either side in front of the mesothorax; one on each side near base of abdomen, one on each side nearly opposite vasiform orifice, and one on each side of groove near caudal margin. Another series arises on the disk of the dorsum; one pair about one-fourth the distance from cephalic margin to base of abdomen; one pair about half of this distance, and the third and fourth pairs on the third and fourth abdominal segments. Vasiform orifice subtriangular, corners rounded, operculum nearly semicircular or reniform; apex somewhat pointed extending slightly more than half the length of the orifice. Lingula with large terminal lobe extending between two spines and three pairs of smaller lateral lobes, longitudinally covered with minute setae.

Adult female about 1.14 mm. long, fore wing about 1.15 x .44 mm., white, immaculate; abdomen pale yellow, thorax, legs, head and antennae pale buff, tip of rostrum black; eyes divided. Antennae of seven segments, the third equalling in length the fourth and fifth combined. Covered with mealy white wax. Male like female, only smaller.

This is probably the most common species of Aleyrodidae in Connecticut, and may be found in nearly every greenhouse. It attacks outside plants in summer, but is probably carried over winter indoors. It causes considerable injury and florists and vegetable growers must spray or fumigate repeatedly and thoroughly to hold the pest in check.

Hosts: Over sixty greenhouse plants and outdoor vegetables are attacked, but this insect shows a preference for *Ageratum*, *Lantana*, *Fuchsia*, heliotrope, melon, cucumber, tomato and tobacco. Occurs under glass throughout the state.

New Haven, 1900, 14 Nov., 1902, 23 Nov., 1903, 5 Feb., 1905, 26 July, 1905, 27 Aug., 1909, July, 1914, 23 Aug., 1915; Bridgeport, 27 Aug., 1901, Milford, 18 July, 1902, Saugatuck, 31 July, 1902, Pomfret, 21 Feb., 1903, Terryville, 21 Oct., 1903, Hartford, 28 Feb., 1905, Norwich, 21 March, 1914.

***T. waldeni** (Britton). *Aleyrodes waldeni*.

Ent. News, xviii, 339, 1907.

Pupa case about .67 x .40 mm., broadly oval, light greenish yellow, vasiform orifice yellow and darker; dorsum rather strongly convex, segmentation evident, marginal area somewhat corrugated or wrinkled, margin finely crenulate; fringed with submarginal row of down-curved glassy wax rods about 10 μ long; just inside this fringe is a row of stouter, more or less curved wax rods, mostly standing upright; other large rods are borne upon the

marginal area and disk of dorsum, the longest being as long as half the width of the body and are arranged as follows: two pairs near cephalic margin, one pair each on prothoracic and meta-thoracic regions, one pair near margin at base of mesothoracic region, two pairs near margin at base of abdomen, one pair on disk of each, the third, fourth, fifth and sixth abdominal segments, one pair near apex of vasiform orifice. Vasiform orifice subtriangular, with angles rounded and sides bulging, about seven-eighths as broad as long; operculum nearly semicircular or slightly reniform, two-thirds as long as broad, reaching half the length of orifice; lingula spatulate, apex seven-lobed, papillose for its entire length, the terminal lobe spiny and projecting between two longer spines which are about $10\ \mu$ in length.

Adult female about .86 mm. long, fore wing about $1. \times .45$ mm., white, immaculate, semitransparent; body yellow, legs and antennae white. Eyes reddish, apparently, but not really divided. Granular wax secretion very scanty and does not have the mealy appearance common to most species. Male smaller than female but differs only in sexual characters.

Hosts: Black walnut, *Juglans nigra*, and butternut, *J. cinerea*.

New Haven, 22 July, 1904 (B. H. W.); Mount Carmel, 24 Sept., 1904, New Canaan, 15 Sept., 1905 (W. E. B.).

Aleyrodes Latreille.

Pupa case, medium size or less, elliptic, brownish or yellowish, margin crenulate, wax tubes irregular and poorly developed; sub-marginal area not differentiated from dorsal disk; without well developed papillae, or evident tracheal folds; wax secretion usually absent. Vasiform orifice subcordate, operculum about half filling the orifice; lingula extended beyond the operculum but not beyond apex of the orifice, the distal end usually setose, and bearing a pair of spines.

Adult, fore wing with two flexures in radial sector, media only a short spur, usually clouded on distal half. Antennae of seven imbricated segments, the third being longest and the distal ones subequal.

Key to Species.

1. Pupa case with segmented disk highly convex and dark brown in color. Adults white or yellowish, fore wings marked with a two-lobed dusky spot **asarumis**
2. Pupa case with disk nearly flat, uniform pale greenish white. Adults white or pale yellow, wings immaculate **fernaldi**

A. asarumis Shimer. *actae* Britton. (Pl. xii, 4.)

Trans. Am. Ent. Soc., i, 281, 1867; Ent. News, xvi, 65, 1905.

Pupa case about 1.5×1 mm., broadly oval, pale yellow or greenish white near the margin, with the dorsal disk dark brown, highly convex, and most abrupt at cephalic extremity. Segmentation prominent, each segment having a median crest darker than the surrounding area. Marginal area radially corrugated or

wrinkled, margin finely crenulate. Pair of setae at anal extremity 43μ long, with second pair 30μ long, situated at a distance from the first pair nearly twice as great as the distance between the setae of the first pair. Entire dorsal surface smooth and shining, without papillae, wax rods or other secretion. Vasiform orifice subtriangular, about 80μ long and nearly as broad, with angles rounded and sides bulging; operculum rhomboid-ovate, half the length of the orifice and two-thirds as long as broad, base nearly a straight line, sides bulging and apex concavely truncate. Lingula spatulate, not lobed but obtusely pointed or rounded, with a pair of prominent spines or setae, 40μ long, at distal extremity; a transverse fold or carina reaches entirely across the broadest portion; distal extremity is densely papillose with short hairs.

Adult female about 1.4 mm. long, fore wing about $1.63 \times .88$ mm., marked as follows: on dorsum a suffused dusky spot at base, a large brown spot at anal extremity with a small brown spot just in front of the large one; on ventral surface a pair of small dark spots near anal extremity. Thorax yellow, dark beneath. Fore wings white with a bilobed dusky spot more or less irregular near distal extremity of radial sector, more distinct in female than in male. Legs and antennae yellow; hind tibiae with two rows of prominent spines on front or under side. Eyes divided by wax secretion. Entire insect more or less covered with a mealy or granular secretion of wax; abdomen bears two latero-ventral tufts of white wax, smaller in male. Male smaller than female, thorax dark above, but otherwise without prominent markings.

Rare, on leaves of baneberry (*Actea*) in Connecticut, and on wild ginger (*Asarum canadense*) in Illinois.

Mount Carmel, 24 Sept., 1904 (Mrs. W. E. Britton).

A. fernaldi Morrill.

Psyche, x, 83, 1903.

Pupa case about $.75 \times .50$ mm., subelliptical, slightly narrowed anteriorly, dorsum nearly flat, margin crenulate; pale greenish white, operculum tinged with yellow, marginal area radially striated with small rounded or conical protuberances. Segmentation apparent.

Adult pale yellow, length about 1 mm., fore wings immaculate, about $1.1 \times .48$ mm. Rostrum usually tipped with black. Eyes dark red, divided. Male smaller than female, but otherwise differing only in sexual organs. Covered with mealy or granular wax secretion.

Common on species of *Spiraea*; also found on strawberry in Massachusetts, and *Cephalanthus occidentalis* in Connecticut.

New Haven, 8 Sept., 1905; 6 Sept., 1906 (W. E. B.).

An additional species, *Aleyrodes azaleae* Baker and Moles, was brought into Connecticut many times during 1913, 1914 and 1915 on Azaleas imported from Belgium, and may be found in greenhouses though it is not known to have become established in this country.

Family COCCIDAE.

SCALE INSECTS.

By WILTON EVERETT BRITTON, PH.D.

The insects of this family differ from all other forms in the females, for the most part, being non-motile and attached to the host plants. On hatching both sexes crawl about for a few hours, then become located on the host plant and feed by sucking its sap. The mealy bugs (genus *Pseudococcus*) are an exception, and are motile during the period of their existence after hatching from the eggs. The males pass through a true pupa stage and emerge with a pair of wings, but the females have no pupa stages and pass through several molts, gradually increasing in size and losing all organs not necessary for their existence.

Not only are scale insects of interest on account of their abnormal morphology and peculiar life histories, but the family is of great economic importance. Some of the worst insect enemies of cultivated plants belong to the Coccidae. A large proportion of our species are not indigenous but have come to us on plants from other countries. Many tropical species have likewise been introduced into greenhouses and some of them require periodic treatment in order to keep them in subjection. On the other hand, lac, which is used extensively in commerce, and forms the body of spirit varnishes and certain printers' inks, is a product of Asiatic scale insects; likewise the dye-stuff, cochineal, is obtained from the dried bodies of a Mexican species, though in recent years this has largely been superseded by aniline dyes.

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The Coccidae are strongly parasitized by minute four-winged chalcidid flies, and are preyed upon by larvae and adult lady-beetles (family Coccinellidae). These two families of insects are important agents in holding the Coccidae in check.

In preparing this paper the author has used freely, and he wishes to give credit for, the descriptive matter, keys and references in the works on classification mentioned above.

The author also wishes to thank Mr. Harold Morrison of the Bureau of Entomology, Washington, D. C., and Professor J. G. Sanders, Director of the Bureau of Plant Industry, Harrisburg, Pa., who have given this manuscript a critical examination and have suggested a number of changes which have been adopted.

The terms used in classification are explained in the accompanying diagrams, Figs. 33-35.

Key to Subfamilies.

- | | |
|--|-----------------------|
| 1. Females without abdominal spiracles; males with simple eyes | 2 |
| Females with abdominal spiracles; males with compound eyes;
adult female active, with wax secretion in form of white lamellae | |
| | ORTHEZIINAE, p. 347 |
| 2. Adult female without separate scale or armor; usually with legs
and without pygidium | 3 |
| Adult female covered by a separate scale or armor; without legs;
abdomen terminating in a compound segment or pygidium; anal
orifice without hairs | DIASPINAE, p. 360 |
| 3. Adult female with deep cleft at posterior extremity; anal orifice
closed above by a pair of triangular plates | COCCINAE, p. 354 |
| Triangular plates absent | DACTYLOPIINAE, p. 348 |

Subfamily ORTHEZIINAE.

Only one genus of this subfamily occurs in our region.

Orthezia Bosc d'Antic.

Head, thorax and abdomen distinct; antennae with eight or nine segments in male, and nine or ten in female; eyes simple; tarsi each with one claw, without digitules. Male with pair of diaphanous wings, with one furcate vein, and two long slender white filaments projecting from near the posterior end of the abdomen. Female with body more or less covered with wax secretion arranged in symmetrical plates, and the eggs are carried until they hatch in an ovisac which projects behind the body.

Key to Species.

- Adult female with dorsal bare streaks *insignis*
 Adult female wholly covered with wax secretion *americana*

O. americana (Walker).

Cat. Homop. Brit. Mus., iv, 1091, 1852.

This species resembles the following but the female has the second and eighth antennal segments longest, with the third, fourth and fifth next, and about equal, with the sixth and seventh smaller and subequal; the first is as thick as long. Tarsi nearly half as long as tibiae; claw medium with a small hair at base on each side. Body elongate, oval, strongly rounded behind, constricted in front, emarginate at base of antennae, rounded at apex, anal ring with six hairs.

The male has nine segments in the filiform antennae, the third the longest, each segment with a swelling at the distal end.

This species occurs in New York and in Canada, but has not yet been recorded from Connecticut.

O. insignis Douglas. Greenhouse Orthezia. (Pl. xiii, 1.)

Jour. Quekettmicr. Club, 169, 1887.

Adult female: Length about 1.5 mm., breadth about 1.2 mm. exclusive of lamellae, broadly oval, ochreous mottled to dark green, distinctly segmented. Antennae with eight segments, all fulvous except the eighth which is black; the first segment is very stout, and the second the shortest and stouter than the remaining segments. Legs light brown, with darker tarsi bearing numerous fine spines. Arranged around the body beginning with the second thoracic segment are numerous wax plates or lamellae which are united posteriorly into a long, parallel-sided sac containing eggs and young.

Adult male: Length about 1 mm., wing expanse about 2.5 mm., body slender, dusky, the last segment bearing a pair of long white filaments; the two wings ovate, transparent, with two veins united at the base.

This species is a destructive pest in greenhouses, attacking *Coleus*, *Lantana*, *Verbena*, *Chrysanthemum*, and many other kinds of plants.

Hartford, 28 Feb., 1905.

Subfamily DACTYLOPIINAE.

This subfamily contains a number of forms which differ greatly in structure and appearance. Some are soft-bodied and motile, with a copious secretion of white wax; while others, like *Asterolecanium* and *Kermes*, are hard and smooth and are fixed upon their host plants. Several species are important pests of vegetation.

Key to Genera.

1. Adult female with a hard shell; legs absent; no cottony wax secretion 2
 Adult female soft-bodied; legs present; white cottony wax secretion 3
2. Body of insect forming a hardened gall-like excrescence usually dull in color and conspicuous on twigs *Kermes*, p. 350
 Body of insect soft and variable in color, but covered with a hard smooth and shining "shell," situated in a depression or pit in the bark *Asterolecanium*, p. 349
3. Anal ring with eight hairs 4
 Anal ring with six hairs 5
4. Adult female dorsally naked, with a fringe of white wax filaments *Gossyparia*, p. 349
 Adult female enclosed in a cottony sac, caudal lobes long *Eriococcus*, p. 351
5. Antennae with nine segments *Phenacoccus*, p. 352
 Antennae with seven or eight segments; body oval *Pseudococcus*, p. 353

Asterolecanium* Targioni-Tozzetti.Asterodiaspis* Signoret.

Only one species of this genus occurs in the northeastern United States and this species came from Europe.

A. variolosum (Ratzeburg) *Asterodiaspis quercicola*. Pitted oak scale. (Pl. xiii, 2.)

Tharander Jahrbuch, 187, 1870.

Adult female: Length 1.5 mm., breadth 1.25 mm., nearly circular, slightly attenuated posteriorly, exterior of case yellowish green, often turning brown after death; smooth and shining, glassy, with a marginal fringe of minute curved glassy rods; moderately convex, partially imbedded in a depression or pit in the bark.

This species was recorded from New Haven, March, 1905, under the name of *Asterodiaspis quercicola*.

Found occasionally on English oak, *Quercus robur*, and its variety *aurea* in nurseries and ornamental plantings.

Hartford, 9 May, 1903; New Haven, March, 1905, 21 Aug., 1915; Yalesville, 4 Sept., 1917, 30 Sept., 1918.

***Gossyparia* Signoret.**

The females of this genus are soft, naked on dorsum and fringed around the margins with white cottony wax secretion. Only one species occurs within our territory.

G. spuria (Modeer) *ulmi*. Elm scale. (Pl. xiii, 3.)

Act. Goth., i, 43, 1778.

Adult female 2-2.5 mm. in length, oval, reddish or purplish in color, dorsum naked, surrounded by an irregular white fringe of cotton-like wax threads. Antennae of six segments, the second

and third longest, fourth and fifth shortest. Legs small and slender, the tibiae shorter than the tarsi, ano-genital ring with eight hairs.

This is an European species attacking elm trees, which is now quite abundant in this country, causing injury to small trees. The females usually settle in the cracks of the bark, and are quite conspicuous. The young are born alive about the middle of June in Connecticut. At first they settle along the veins of the leaves, chiefly on the under side, and later return to the crevices of the bark on the trunk and larger branches. There is one generation each year. Spraying with kerosene emulsion is the remedy.

New Haven, 3 June, 1900; 27 June, 1901; 6 Aug., 22 Sept., 1917, 20 Sept., 1919; Southington, 2 June, 1903; Yalesville, 26 June, 1911; South Norwalk, 19 June, 1912; Colchester, 16 June, 1913; Sharon, 7 June, 1913; Meriden, 12 June, 1919; Chester, 26 Aug., 1918, 7 Aug., 1919; Sound Beach, 9 Oct., 1918.

Kermes Boitard.

Globular or reniform with a hard and dull surface, from 3-10 mm. in diameter, conspicuous on oak twigs and resembling galls. Segmentation is not distinct though sometimes revealed by dark bands or rows of dark spots.

Key to Species.

1. Globular or nearly circular in outline when viewed from above .. 2
Not globular, longer than wide, or wider than long 5
2. Surface smooth, 4-6 mm. in diameter 3
Smaller-sized species 4
3. Yellowish brown with four transverse bands of darker brown **waldeni**
4. Surface shining, finely and sparsely pubescent; 3-5 mm. in diameter
pubescens
Surface dull, gray, 3 mm. in diameter **perryi**
5. Distinctly longer than broad 6
Distinctly broader than long 7
6. Light yellowish brown, with darker marblings, and pale mid-dorsal
line **kingii**
Covered with white powder except on middle of dorsum **nivalis**
7. Color whitish on twigs 8
Color not whitish 9
8. Dark gray becoming whitish on the twigs; 6 x 7 mm. **galliformis**
Whitish becoming light yellow **sassceri**
9. Dark purplish brown with distinct dark median groove on dorsum;
3 x 4 mm. **pettiti**
Gray speckled with black, median groove obscure or shallow;
5.5 x 6 mm. **trinotatus**

K. galliformis Riley.

Am. Nat., xv, 482, 1881.

Reported from Connecticut without definite records; also from Massachusetts, New York, and New Jersey.

K. kingii Cockerell.

Ann. Mag. Nat. Hist., ii, 330, 1898.

New Haven, 24 Jan., 1911; 11 Nov., 1915 (B. H. W.); 26 Aug., 1913 (Q. S. L.).

K. nivalis King and Cockerell.

Ann. Mag. Nat. Hist., ii, 330, 1898.

Reported from Massachusetts.

K. perryi King.

Psyche, ix, 81, 1900.

Reported from Massachusetts.

K. pettiti Ehrhorn.

Can. Ent., xxxi, 7, 1899.

Occurs in Canada, Massachusetts, and New York.

K. pubescens Bogue.

Can. Ent., xxx, 172, 1898.

New Haven, 20 Aug., 1905 (H. L. V.); 27 June, 1913 (W. E. B.); 24 June, 21 July, 1915 (B. H. W.).

K. sassceri King. (Pl. xiii, 4.)

Pom. Jour. Ent. Zool., vi, 48, 1914.

New Haven, 26 July, 1906; 12 Oct., 1908; 11 Nov., 1913; Putnam, 17 Apr., 1906 (B. H. W.); Meriden, 27 Aug., 1913 (H. L. J.); Farmington, 26 June, 1915 (Nathaniel Slocombe).

K. trinotatus Bogue.

Can. Ent., xxxii, 205, 1900.

Recorded from New York, New Jersey, and Ohio.

***K. waldeni** King.

Jour. Econ. Ent., 7, 150, 1914.

Portland, 12 Aug., 1913 (B. H. W.).

Eriococcus Targioni-Tozzetti.

Both sexes enclosed in a white, dense, felt-like sac, ovoid in shape. Female antennae with seven or eight segments; male antennae of ten segments; anal ring with eight hairs.

Key to Species.

Tibiae nearly twice the length of the tarsi**quercus**

Tibiae shorter than tarsi**azaleae**

E. azaleae Comstock. Azalea bark scale.

Rept. U. S. Dept. Agr., 338, 1880.

Female: Length of sac 3 mm., thickness 1.5 mm.; sac nearly oval, white, covered with projecting white wax filaments. Female dark purple, almost black, nearly naked, a small amount of wax secretion occurring on posterior portion of ventral surface; dorsal surface covered with large acuminate yellow spines; antennae with six segments, first, second, third and sixth subequal, and nearly twice the length of the fourth and fifth. Tibiae about two-thirds

as long as the tarsi; tarsal digitules long and slender, the claw large and strong.

On twigs and stems of *Azalea*, *Rhododendron* and *Crataegus*.

Hartford, 26 July, 1916 (P. Hansling); New Haven, 5 June, 1922 (M. P. Z.).

E. quercus (Comstock). *Rhizococcus quercus*.

Rept. U. S. Dept. Agr., 340, 1880.

Female tibiae twice as long as tarsi.

On oak, *Vaccinium* and grass.

Recorded from Massachusetts and probably occurs in Connecticut.

Phenacoccus Cockerell.

Females with antennae of nine segments, and which construct more or less distinct ovisacs. Only two species are found in our territory, one an important pest of maple shade trees, and the other occurs in ants' nests.

Key to Species.

Forming cottony egg-mass on maple leaves; female 5 mm. in length

acericola

Without wax covering, in ants' nests; female 3.5 mm. in length ..

americanae

P. acericola King, erroneously *Pseudococcus aceris*. Woolly maple leaf scale. False maple scale. (Pl. xiii, 5 and 6.)

Can. Ent., xxxiv, 211, 1902.

Appearing on the under sides of the leaves as an irregular oval cottony mass, in the center of which is the female and her eggs.

Female: Length about 5 mm., width about 3 mm., light yellow; spinnerets scattered over the dorsal surface, most abundant at posterior extremity. Margin of body with several groups of stout spines; antennae of nine segments, the ninth being longest; first, second, third and fifth about equal, with the fourth, sixth, seventh and eighth shorter and subequal.

The young are hatched on the leaves, where they feed until mature, the males transforming in white woolly cases in the crevices of the bark. On the approach of winter the females also go into the crevices of the bark of the trunk and larger branches where they hibernate in woolly wax cases similar to those of the males. There are three generations each year.

On sugar and Norway maple. A pest of shade trees in cities. Occurs throughout the state.

New Haven, 29 Aug., 1905; 10 Aug., 1911; 1 July, 1919; West Haven, 26 March, 1906; 31 Aug., 1915; Bridgeport, 11 Feb., 1906; 16 Oct., 1911; Hartford, 27 March, 1906; Danbury, 13 Aug., 1907; 14 June, 12 July, 1911; New Britain, 9 Aug., 1906; 3 Sept., 1912; Meriden, 17 Apr., 1907; 9 Sept., 1912; 14 Sept., 1915; Greenwich, 3 July, 1909; 20 Aug., 1910; Stamford, 22 Aug., 1910; Ansonia, 12 Aug., 19 Sept., 1911; South Norwalk, 26 March, 1912; New London, 25 July, 1913; Waterbury, 19 Aug., 1915; Glastonbury, 11 Aug., 1919; Naugatuck, 16 Aug., 1919.

P. americanae King and Cockerell.

Can. Ent., xxix, 91, 1897.

Female: Length 3.5 mm., without wax secretion or spines, reddish brown.

Occurring in nest of the ant, *Lasius americanus*, in Massachusetts.

Pseudococcus Westwood.*Dactylopius* Targioni-Tozzetti.

MEALY BUGS.

Body oval, covered with a thick white mealy secretion, not obscuring segmentation; margins bearing equidistant white waxy appendages, which are longer posteriorly than laterally. Forming ovisac in leaf sheaths and axils.

Female: Antennae of eight joints; the eighth being longer than the seventh; anal lobes small or rudimentary; anal ring with six hairs.

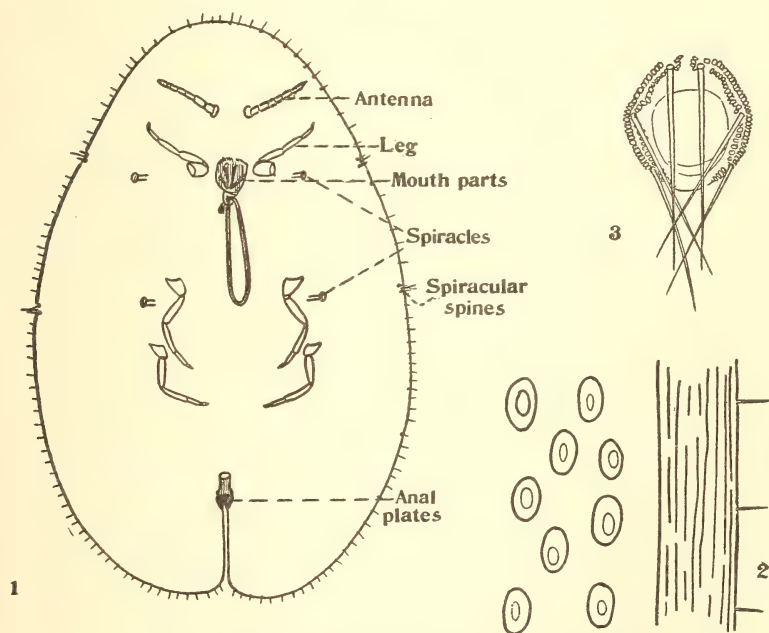


FIG. 33. Coccid structures (Coccinae and Dactylopiinae). (1) *Saissetia hemisphaerica* Targioni-Tozzetti, ventral view. (2) Derm pores and margin of same,—greatly enlarged. (3) *Pseudococcus citri* Risso,—anal ring (after Dietz and Morrison). Greatly enlarged. Drawing by Dr. Philip Garman.

Male: Abdomen bearing two long caudal filaments; puparium felted.

At least two species are common greenhouse pests, and the others may occur within the state.

Key to Species.

1. Large hairs of anal lobes scarcely longer than hairs of anal ring 2
Large hairs of anal lobes nearly twice as long as hairs of anal ring;
female dorsum covered with irregular wax secretion; marginal
filaments all rather short, finger-like**citri**
2. Pores of anal lobes distinctly grouped around the two stout spines 3
Pores of anal lobes scattered, not distinctly grouped around the
stout spines; dorsum covered with stout pyramidal wax eleva-
tions; marginal filaments, short and stout**nipae**
3. Tarsal claw about half the length of tarsus; body with long caudal
wax filaments; common on many greenhouse plants**adonidum**
Tarsal claw not more than one-third the length of tarsus; found
out-of-doors on clover and under sycamore bark**trifolii**

P. adonidum Linnaeus. *longispinus*. Long-tailed mealy bug.

Syst. Nat., Edn. 12, 140, 1762.

Occasionally found on various plants in greenhouses. It has been observed several times by the writer, though definite records were not preserved.

Hartford, 4 Oct., 1919.

P. citri Risso. *destructor*. Common or short-tailed mealy bug.
(Pl. xiii, 7.)

Essai, Hist. Nat., des Oranges, 1813.

This is the commonest and most destructive species of the genus, attacking many different kinds of plants under glass.

Southington, 1 Feb., 1902; New Haven.

P. nipae Maskell. *pseudonipae* Cockerell.

Mich. Agr. Expt. Sta., Spec. Bull. 2, 28, 1896; Science Gossip, N. S. iii, 189, 302, 1897.

This species occurs on palms in greenhouses, has been reported from Massachusetts, and may be found in Connecticut.

P. trifolii Forbes. Clover root mealy bug.

Rept. Ins. Ill. 14, 72, 1885.

Though not yet recorded from Connecticut, it may occur in the state; reported from New York.

In addition to the species listed above, *P. bromeliae* Bouché, *P. claviger* King and Tinsley, *P. cockerelli* King and Tinsley, *P. sorghiellus* Forbes and its variety *kingii* Cockerell, have all been reported from Massachusetts, mostly in ants' nests, and may occur in Connecticut.

Subfamily COCCINAE.

The scales belonging to this subfamily are commonly known as "soft scales," and are among the largest species of scale insects.

For the most part the females consist of a flattened or convex derm or shell which is part of the insect, and which is usually brown in color. On the death of the female a mass of eggs remains under the shell, except in *Pulvinaria*, which secretes a white, cottony ovisac. This shell is usually heavily chitinized, with the caudal extremity distinctly cleft, at the apex of which are a pair of anal plates; between and below these plates is the anal opening, the ring bearing from eight to ten hairs. Some species are found on the bark of native trees and shrubs, and others occur on the leaves and stems of greenhouse plants.

Key to Genera.*

1. Female not globular 2
Female globular; on conifers *Physokermes*, p. 360
2. Female more or less convex; derm not marked off into plate-like areas; anal cleft rather short 3
Female rather flat, marked off by lighter lines into plate-like areas; anal cleft very long; middle spiracular spine more than twice as long as outer ones *Eucalymnatus*, p. 356
3. Antennae and legs fairly well developed; anal ring with eight hairs; middle spiracular spine distinctly longer than the other two 4
Antennae and legs rudimentary; anal ring with ten hairs; spiracular spines all short and stout, nearly equal in length; setae around anal plates, of two sizes; derm with circular gland pores; hemispherical, irregular, occurring in clusters on branches of tulip tree *Toumeyella*, p. 356
4. Female not secreting an ovisac; eggs deposited beneath the body 5
Female secreting a white, cottony ovisac in which the eggs are deposited; middle spiracular spine more than twice the length of the other two *Pulvinaria*, p. 355
5. Female body convex; derm with large circular or oval pores 6
Female body flattened or only slightly convex; oval or elongate oval; derm with small scattered pores *Coccus*, p. 356
6. Derm crowded with pores; middle spiracular spine more than twice as long as the outer two *Saissetia*, p. 359
Derm not crowded with pores; middle spiracular spine (except in *nigrofasciatum*) less than twice as long as the outer two *Lecanium*, p. 357

Pulvinaria Targioni-Tozzetti.

The females of this genus resemble those of *Lecanium*, until they oviposit; the eggs are laid in a large white, cottony ovisac with the body of the female inclined at an angle with the resting surface, attached to one end of the ovisac.

Key to Species.

- Adult female with large circular or oval, closely-set, derm pores on center of dorsum; ovisac elongate; on leaves of maple *acericola*
- Adult female with smaller, scattered or irregularly grouped derm pores; ovisac scarcely longer than body; on twigs *vitis*

* The following key has been adapted from "The Coccidae or Scale Insects of Indiana" by Dietz and Morrison.

P. acericola Walsh and Riley.

Am. Ent., i, 14, 1868.

Very conspicuous on the under side of the leaves of soft maple. Recorded from Massachusetts, New York, and New Jersey, and may be found in Connecticut.

P. vitis Linnaeus. *innumerabilis* Rathvon. Cottony maple scale. (Pl. xiii, 9.)

Syst. Nat., Edn. 10, 456, 1758; Penn. Farm Jour., 256, 1854.

Common on twigs of soft maple and other trees and shrubs.

Norwich, 12 Sept., 1905; Branford, 2 June, 1906; Bridgeport, 19 July, 1910; 29 June, 1912; 8, 14 July, 1913; Hartford, 8 July, 1910, 13 June, 1922; Cheshire, 1 Oct., 1913, 13 June, 1922; Danbury, 6 June, 1914; Sound Beach, 15 June, 1921; South Norwalk, 2 July, 1912; Milford, 19 June, 1913; New Haven, 16 June, 1910, 30 July, 1917; Wethersfield, 7 July, 1916.

Eucalymnatus Cockerell.

Female only slightly convex, elongate-oval, irregular, with deep anal cleft; entire surface marked off into plate-like areas. Only a single species is likely to occur in the state, and that attacks a variety of plants in the greenhouse.

E. tessellatus Signoret.

Ann. Soc. Ent. Fr., iii, 401, 1873.

Not yet recorded from Connecticut.

Coccus Linnaeus.

Female slightly convex, oval, derm pores scattered, small; middle spiracular hair more than twice as long as outer two; anal ring with eight hairs. Occurring on greenhouse plants.

Key to Species.

Body oval; antennae normally with seven segments**hesperidum**

Body elongate; antennae normally with eight segments**elongatus**

C. elongatus Signoret. *longulus* Douglas.

Ann. Soc. Ent. Fr., iii, 404, 1873; Ent. Mon. Mag., xxiv, 97, 1887.

Not yet recorded from Connecticut, but reported from Massachusetts and New York.

C. hesperidum Linnaeus. Soft scale.

Syst. Nat., Edn. 10, 455, 1758.

Common in New Haven on various plants in greenhouses. Also West Cornwall, 17 April, 1911; Wallingford, 23 March, 1915; Hartford, 16 July, 1915.

Toumeyella Cockerell.

Body strongly convex, oval to circular, often hemispherical, though irregular. Antennae and legs rudimentary. Spiracular spines short, stout and nearly equal in length. Anal ring bearing ten hairs.

T. liriodendri Gmelin. *Lecanium tulipiferae* Cook. *Eulecanium tulipiferae*. Tulip-tree scale. (Pl. xiv, 2.)

Syst. Nat., Edn. 13, 2220, 1789.

This is our largest scale insect, often nearly one-third of an inch in diameter. It occurs on the lower branches of the tulip-tree *Liriodendron tulipifera*, and also on linden and magnolia.

Found throughout the state. Our records are from Berlin, Branford, Bridgeport, Bristol, Brookfield, Collinsville, Columbia, Danbury, Deep River, East Hartford, Fairfield, Glastonbury, Greens Farms, Greenwich, Hamden, Hartford, Killingworth, Lyme, Middletown, Naugatuck, New Canaan, New Britain, New Haven, New London, Newtown, Norwalk, Norwich, Plantsville, Pomfret, Rockville, Ridgefield, Rowayton, Southington, Southport, South Windsor, Springdale, Stamford, Stratford, Suffield, Talcottville, Waterbury, Waterford, West Haven, Wilton, Woodbury and Woodbridge.

A closely allied species, usually listed as *Neolecanium cornuparvum* Thro, occurs on magnolia and may be found in Connecticut. Apparently Dietz and Morrison* consider this species congeneric with *Toumeyella liriodendri*. It may be distinguished from *liriodendri* by its more elongate and less convex shape.

Lecanium Burmeister.

Eulecanium Cockerell.

Commonly known as soft scales, usually brown, oval to circular, convex; anal ring with eight hairs; legs and antennae fairly well developed; except in one species (*nigrofasciatum*) the middle spiracular spine is not twice as long as the outer two.

Key to Species.

1. Female dorsum without appendages; middle spiracular spine not twice as long as the outer ones 2
 Female dorsum with a row of about thirty minute conical appendages extending forward from the anal cleft; derm pores not grouped; middle spiracular spine more than twice the length of the outer two **nigrofasciatum**
2. Anal plates at least half as wide as long 3
 Anal plates less than half as wide as long **caryae**
3. Smallest spiracular spine not twice the average length of a marginal spine; derm pores more or less definitely grouped 4
 Smallest spiracular spine at least twice the average length of a marginal spine; derm pores not grouped, scattered; strongly convex, sometimes nearly globular; on oak **quercifex**
4. Derm pores arranged in rows radiating from the center of the body 5
 Derm pores not arranged in rows radiating from the center of the body 6
5. Derm pores large, and arranged in single rows radiating from the center of the body; surface fairly smooth, not roughened or wrinkled; occurring only on Arbor-vitae **fletcheri**

* The Coccidae or Scale Insects of Indiana, office of the State Entomologist, Indianapolis, Ind., April, 1916.

Derm pores small, arranged in irregular or broken rows radiating from the center of the body; surface irregularly roughened; body convex, derm heavily chitinized; not occurring on conifers **corni**

6. Body small, nearly globular, dark red; a compound row of small derm pores extending forward from the anal plates**prunastri**

Body large, convex, dark reddish brown; derm pores small, regularly arranged though not as in *prunastri* or *corni***pruinorum**

L. caryae Fitch. *cockerelli* Hunter. Hickory Lecanium.

Rept. Ins. N. Y., iii, 443, 1856.

The largest species of the genus being 10-13 mm. long and 7-9 mm. broad. Occurs on hickory, elm, sycamore, black walnut, and wild red cherry.

Reported from Maine, Massachusetts, and Ohio.

Cheshire, 26 Aug., 1918 (B. H. W.); Branford, 1 June, 1922.

L. corni Bouché. *cerasifex*, *juglandifex*, *corylifex*, *fitchii*, *armeniaceum*, *canadense*, *kingii*, *fraxini*. (Pl. xiii, 8.)

Stett. Ent. Zeit., v, 298, 1844.

A medium-sized, very convex species, occurring throughout the state on a great number of hosts including rose, blackberry, ash, chestnut, elm, linden, maple, peach, plum, and pear.

Our records are as follows: Ansonia, Berlin, Bethany, Bethel, Branford, Bridgeport, Cheshire, Chester, Danbury, East Hartford, Farmington, Haddam, Guilford, Killingworth, Lyme, Madison, Meriden, Middletown, Milford, New Haven, New London, New Milford, Norwalk, Norwich, Oneco, Plainville, Plantsville, Pomfret, Ridgefield, Rockville, Southington, Sterling, Stratford, Waterbury, Waterville, Wethersfield, Windsorville, West Cornwall, and West Haven.

L. fletcheri Cockerell.

Can. Ent., xxv, 221, 1893.

This is a small species occurring on *Arbor-vitae*. It has not yet been taken in Connecticut but has been reported from Canada, Massachusetts, and New York.

L. nigrofasciatum Pergande. *Eulecanium*. Terrapin scale. (Pl. xiv, 1.)

Bull. 18, n. s., Div. Ent., U. S. Dept. Agr., 26, 1898.

A small convex species common on the twigs of soft maple and many other native and introduced trees and shrubs. It lives over winter in a half grown condition, and is of considerable economic importance, occurring throughout the state.

Bridgeport, Bristol, Danbury, Deep River, Durham, Forestville, Hartford, Milford, Middletown, New Haven, Norwich, Seymour, South Glastonbury, Thompsonville, Watertown.

L. prunastri Fonscolombe. Globular scale.

Ann. Soc. Ent. Fr., iii, 423, 1873.

This small dark red, almost globular species is found on plum, cherry, and peach in central Pennsylvania where it is a pest. It has not yet become distributed throughout the eastern United States, though it is said to be rather common in Europe. It has

also been reported from New York and Ohio, but has not as yet been recorded from Connecticut.

L. pruinoseum Coquillett. *robiniae*. Frosted scale.

Ins. Life, iii, 382, 1891.

In some situations this scale is covered with fine powdery wax; hence the name. In California it attacks the stone fruits as well as apple, pear, ash, locust, walnut, grape, and rose. It has not been recorded from Connecticut, though reported from Canada, New York and Massachusetts.*

L. quercifex Fitch. *quercitronis*, *antennatum*. Oak *Lecanium*.

Rept. Ins. N. Y., v, 805, 1858.

This species attacks oak trees, and though not recorded from Connecticut, it has been found in Canada, Massachusetts, and New York.

Saissetia Deplanches.

Female scale nearly hemispherical, strongly convex; derm closely crowded with large pores, circular to oval in shape; middle spiracular spine exceeding twice the length of the two outer spines; anal ring with eight hairs.

One species is perhaps our commonest soft scale on greenhouse plants and the others may also occur.

Key to Species.

- 1. Adult female brown 2
- Adult female black *nigra*
- 2. Female strongly convex, nearly hemispherical, dark brown, with two transverse ridges and a median longitudinal ridge forming a letter H; derm thick with large closely-set pores; caudo-lateral margins of anal plates distinctly longer than cephalo-lateral margins *oleae*
- Female hemispherical, lighter in color, without ridges; derm pores slightly smaller and farther apart; caudo-lateral margins of anal plates scarcely longer than cephalo-lateral *hemisphaerica*

S. hemisphaerica Targioni-Tozzetti. *Lecanium coffeae*, *filicum*.

Hemispherical scale. (Pl. xiv, 3.)

Studii sul Cocc., 26, 1867.

Perhaps the commonest greenhouse species infesting nearly all kinds of plants. It is of considerable economic importance, occurring throughout the state.

Hamden, Milford, New Haven, Shelton, Sterling, Suffield, Terryville, Washington, Waterbury, West Goshen.

S. nigra Nietner. *depressa*. Black scale.

Enemies of Coffee Tree, 9, 1861.

Occasionally occurring on greenhouse plants though not recorded from the state.

* Morrison considers that most of the records of this and the preceding species from the eastern United States refer to *L. corni*.

S. oleae Bernard. *cycadis, cassiniae*. Olive scale.

Mem. d'Hist. Nat. Acad., Marseilles, 108, 1782.

This species may be recognized by its H-shaped mark, its dark brown color, and the minute flakes of wax.

Though not recorded from the state, it probably occurs here in greenhouses.

Physokermes Targioni-Tozzetti.

Globular and rigid occurring only on the twigs of conifers. Body with two internal ovarian pouches. Adults without legs or antennae, though both are present in the larvae. Only a few species are known, one of which occurs in Connecticut.

P. piceae Schrank. *abietis*. Spruce scale.

Hist. Abr. Ins., i, 507, 1762.

Adult female globular 1.5-3 mm. in diameter, old shells rigid, chestnut brown in color, usually in groups at base of twigs, and resembling buds.

On spruce and pine.

Hartford, 23 June, 1906 (W. H. Patton).

Subfamily DIASPINAE.

To this group belong the armored scales, insects which are covered by a scale or shell, formed in part by the exuviae or cast-off skins, and in part by a secretion of wax. The pupa stage is present only in the male. The female early loses organs of sight and locomotion and can only feed and reproduce. In some species the female parent brings forth living young, and in others, lays eggs under the shell or scale.

Of the scale insects which are pests of trees and plants in temperate regions, the most destructive belong to the subfamily Diaspinae.

Key to Genera.

- | | |
|--|-----------------------|
| 1. Scale of female circular or nearly so; exuviae central or subcentral | 2 |
| Scale of female elongated, exuviae at narrow end | 7 |
| 2. Scale of male much elongated, not resembling scale of female | 3 |
| Scale of male slightly elongated, but resembling scale of female in color and texture | 6 |
| 3. Scale of male white and carinated | 4 |
| Scale of male not white and not carinated | Parlatoria, p. 380 |
| 4. Scale of female subcircular or pyriform; male tricarinate; usually fully exposed on bark | 5 |
| Scales occurring under moss, lichens or edges of bark | |
| | Epidiaspis, p. 368 |
| 5. Exuviae usually subcentral | Diaspis, p. 366 |
| Exuviae near margin | Aulacaspis, p. 369 |
| 6. Pygidium of female with elongated chitinous processes extending forward from bases of lobes | Chrysomphalus, p. 376 |
| Pygidium of female with chitinous processes smaller, shorter or wanting altogether | Aspidiotus, p. 371 |

7. Scale of female without carina 8
Scale of female with sharp median carina; second stage skin swells to form a shell within which the female remains and oviposits .. Fiorina, p. 370

8. Scale of male similar to scale of female though smaller; without carina 9
Scales of male white, sides parallel, and usually with median carina 13

9. Scale of female elongate, often curved, exuviae small 10
Scale of female circular to elongate, exuviae covering nearly one-third its lengthParlatoria, p. 380

10. Scale of female broadened posteriorly; on hardy plants 11
Scale of female much elongated, sides nearly parallel; pygidium with peculiar lattice-like thickening of dermis. On greenhouse plantsIschnaspis, p. 379

11. Scale of male similar to that of female though smaller; pygidium of female with five groups of circumgenital gland-orifices 12
Scale of male narrow, whitish, without carina; pygidium of female with more than five groups of circumgenital gland-orifices: second stage skin swells to form a shell within which the female remains and ovipositsLeucaspis, p. 370

12. Scale of female convex or flattened, 2.5-3 mm. long, dark brown; median lobes of pygidium broad, with shallow notches on both inner and outer marginsLepidosaphes, p. 378
Scale of female 1-1.5 mm. long. Median lobes of pygidium narrow, inner margin entire, outer margin notchedPinnaspis, p. 370

13. Scale of female elongate, pyriform, white, on bark or leaves of hardy plantsChionaspis, p. 361
Scale of female varying from white to dark brown or gray, tropical species on greenhouse plantsHemichionaspis, p. 366

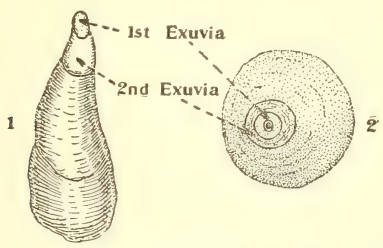


FIG. 34. Coccid structures (Diaspinae). (1) *Lepidosaphes ulmi* Linnaeus,—scale of female. (2) *Chrysomphalus aonidum* Linnaeus,—scale of female. Greatly enlarged. Drawing by Dr. Philip Garman.

Chionaspis Signoret.

This genus contains several species, which occur mostly on hardy plants, being found on the bark and sometimes on the leaves. In most species the males are white, narrow, and much smaller than the females, which are pyriform, white or light gray, with the exception of *C. euonymi*, which are dark gray. A few species only are considered to be pests.

Key to Species.

1. Scale of male narrow, carinated more or less distinctly 2
Scale of male oval, without carinae *ortholobis*
2. Median lobes of female not fused their entire length 3
Median lobes fused almost to their tips 4
3. Mature female scale usually more than 2 mm. long 5
Mature female scale usually less than 2 mm. long *corni*
4. Median lobes notched on their outer margins *americana*
Median lobes entire on their outer margins *caryae*
5. Median lobes pointed apically 6
Median lobes distinctly rounded apically 7
6. Median lobes and lobules of second and third lobes pointed and striate *euonymi*
Median lobes indistinctly pointed *lintneri*
7. Median lobes broadly rounded 8
Median lobes narrowly rounded, diverging *pinifoliae heterophyllae*
8. Median lobes close together 9
Median lobes separated *pinifoliae*
9. Both median and second lobes rounded and parallel in general direction *salicis-nigrae*
Second lobes bluntly pointed and converging *furfura*

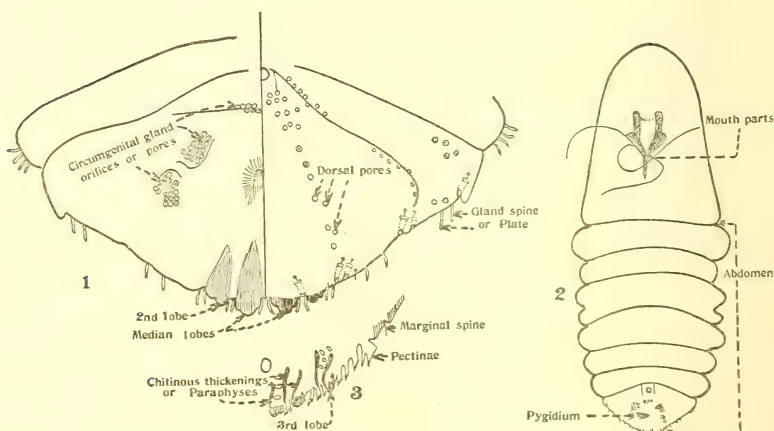


FIG. 35. Coccid structures (Diaspinae). (1) *Lepidosaphes ulmi* Linnaeus,—pygidium of female showing dorsal and ventral surfaces. (2) *Lepidosaphes ulmi* Linnaeus,—female, showing general appearance. (3) *Chrysomphalus aonidum* Linnaeus,—margin of female pygidium (after Dietz and Morrison). Greatly enlarged. Drawing by Dr. Philip Garman.

C. americana Johnson. White elm scale.

Ent. News, vii, 150, 1896.

Scale of female: Length 2-3 mm., white, sometimes yellowish, often blackened by sooty mold; convex, broadest near middle. On removing from bark a conspicuous white mark remains.

Female: Median lobes prominent, fused on their inner, and notched on their outer, margins. Median group of circumgenital

gland-orifices, 20-30; anterior lateral, 18-42; posterior lateral, 20-30.

Scale of male: Length 1 mm. or less; lateral margins parallel tricarinate, white, exuviae pale yellow. Eggs purplish. There are two generations each year in Ohio.

Common on elm, *Ulmus americana*, often injuring young trees.

Hartford, 5 Sept., 1903; New Haven, 9 Dec., 1903; 22 Sept., 1917, 3 Oct., 1918; Norwich, 24 Nov., 1914; Simsbury, 29 Nov., 1907; Torrington, 16 June, 1910.

C. caryae Cooley.

Can. Ent., xxx, 86, 1898.

Scale of female: Length 1.7-2 mm., dirty white, exuviae dark brown, inconspicuous on bark of host plant, irregular in shape.

Female: Median lobes large and prominent, entire inner margins fused nearly to tips. Median groups of circumgenital gland-orifices, 12-19; anterior lateral, 21-29; posterior lateral, 15-22.

Scale of male: Length .5-.7 mm., white, exuviae pale brown, one-third the length of the scale; scale elliptical with a distinct median carina.

On bark of hickory, especially in the crevices and under the edges of the loose bark.

New Haven, 27 Aug., 1906 (W. E. B.).

C. corni Cooley. (Pl. xiv, 7.)

Mass. Agr. Expt. Sta., Spec. Bull., 15, 1899.

Scale of female: Length 1.5-2 mm., white, with exuviae orange-yellow or brown.

Female: Median lobes fused for half their length, then separating by nearly straight lines toward their diverging tips, which are almost pointed. Median group of circumgenital gland-orifices, 10-16; anterior laterals, 20-24; posterior laterals, 10-17.

Scale of male: Length .6-.8 mm., white, narrow, tricarinate, exuviae, pale yellow, about one-third the length of the scale.

Occasionally very abundant on pigeon bush, *Cornus candidissima* (*paniculata*) and other species of *Cornus*.

Hamden, 14 March, 1910; Southington, 26 Nov., 1914; Bantam, 2 Nov., 1916.

C. euonymi Comstock. *Euonymus* scale. (Pl. xiv, 6.)

Rept. U. S. Dept. Agr., 313, 1881.

Scale of female: Length about 2 mm.; dark grayish brown; broadly pyriform, convex, thick and firm in texture.

Female: Median, second and third lobes pointed and serrulate. Median group of circumgenital gland-orifices, 4-6; anterior lateral, 5-9; posterior lateral, about 4.

Scale of male: Length 1.5 mm. White, with yellow exuviae, tricarinated.

A serious pest of *Euonymus*, especially *radicans*.

Hartford, 29 March, 1905; Middlebury, 26 Nov., 1906; Greenwich, 22 Apr., 17 Oct., 1910; New Haven, 29 Oct., 1912; 11 Sept., 1916; Apr., 1920; Stratford, 20 Aug., 1913, 29 Aug., 1919; Bridgeport, 24 Nov., 1915; Bantam, 29 Nov., 1916; Norwalk, 6 Oct., 1916; Stamford, 29 Apr., 1919; Wilton, 28 Oct., 1920; Saugatuck, 1 March, 1921; New Canaan, 23 July, 1921.

C. furfura (Fitch). *Aspidiotus furfurus*. *Aspidiotus harrisi*.
Scurfy scale. (Pl. xiv, 4.)

Rept. Ins. N. Y., iii, 352, 1856.

Scale of female: Length 2-2.5 mm., white or light gray, broadly pyriform and flat, often curved, exuviae yellowish brown.

Female: Median lobes broadly rounded, entire, converging, striate; five groups of circumgenital gland-orifices; median 7-16; anterior lateral, 22-32; posterior lateral, 16-22.

Scale of male: Length .7-1 mm.; white, exuviae pale yellow, covering about one-third; distinctly tricarinate.

This species winters in the form of purplish eggs under the female scale. These eggs hatch the last week in May. There is but one brood each year. This insect is a minor pest and is common on apple, pear, currant and hawthorn throughout the state. The records in the office of the State Entomologist show that it has been received more than one hundred times from sixty-two towns, each county being represented.

Variety *fulva* King was described from Massachusetts on *Rhamnus cathartica* on account of its unusual color due to the overlying epidermis.

C. lintneri Comstock.

Second Rept. Dept. Ent., Cornell Univ., 103, 1883.

Scale of female: Length 2.5-3.2 mm.; dull, dirty white, exuviae yellowish brown; broadly pyriform, flattened, thin and flexible.

Female: Median lobes obscurely pointed and faintly serrate. Five groups of circumgenital gland-orifices; median groups 11-19; anterior lateral, 25-42; posterior lateral, 19-28.

Scale of male: Length .8-1 mm.; white, exuviae yellow or colorless, extending about two-fifths the length, parallel-sided, narrow, distinctly tricarinate.

This species is a native of the United States and occurs on alder, birch, spice bush, *Cornus* and *Viburnum*.

Stonington, 18 May, 1907.

C. ortholobis Comstock.

Rept. U. S. Dept. Agr., 317, 1881.

Scale of female: Length 2-2.5 mm., dirty white, exuviae brown, pyriform, somewhat elongated, broadest at middle.

Female: Median lobes straight, parallel, and close together, rounded apically, sometimes serrate exteriorly. Median group of circumgenital gland-orifices, 10-25; anterior lateral, 18-35; posterior lateral, 16-24.

Scale of male: Length .6-.8 mm.; white, exuviae pale brown or colorless. Scale oval without carinae.

Occurs on poplar, willow and butternut. Has not been taken in Connecticut but has been recorded from Massachusetts and doubtless occurs here.

C. pinifoliae (Fitch). Pine leaf scale. (Pl. xiv, 5.)

Rept. Ins. N. Y., ii, 488, 1855.

Scale of female: Length 3-4 mm., very convex, sides nearly parallel, broadened somewhat posteriorly, though varying in shape according to width of leaf of the host. Snow white, with exuviae bright orange or brown.

Female: Median lobes broadly rounded, separated, striate and entire. Median group of circumgenital gland-orifices 7-13; anterior lateral, 12-20; posterior lateral, 14-18.

Scale of male: Length 1-1.3 mm.; white, exuviae pale yellow. shape ellipsoidal, slightly broadened posteriorly, tricarinate.

There are two generations each year, though not easily distinguished. Native on the leaves of various species of pine and spruce in the eastern United States, often injuring seedlings and small trees. Occurs throughout the state.

Hartford, 19 Oct., 1903, 12 Sept., 1905, 5 Feb., 1908, 6 Apr., 1910, 20 Sept., 1916, 20 Sept., 1917, 24, 27 Sept., 1918, 5 Sept., 3, 4 Oct., 1919; New Haven, 29 June, 1908, 26 Aug., 25 Oct., 1909, 31 Jan., 1913, 23 May, 1914, 3 June, 1919; Manchester, 15 Aug., 1918, Aug., 1919; South Manchester, 27 May, 1902, 3, 21 Aug., 1909; 18 March, 1914; Thompson, 14 Apr., 1906; Rainbow, 10 June, 1907; Riverside, 28 Sept., 1911; Greenwich, 2 Oct., 1912, 15 Jan., 1919; Cos Cob, 2 Aug., 1913, 12 June, 1914; New Canaan, 13 Nov., 1912; Avon, 5 Oct., 1915; Bridgeport, 24 Nov., 1915; Bristol, 4 Oct., 1916, 11 Oct., 1918; Stamford, 1 Oct., 1917; Cromwell, 21 Aug., 1918; Wallingford, 30 July, 1918; Meriden, 20 May, 1921, 5 Nov., 1920; Sharon, 28 July, 1921; Simsbury, 21 Jan., 1921; Rockville, 17 Sept., 1921; Danielson, 15 June, 1922.

C. pinifoliae var. heterophyllae Cooley.

Can. Ent., xxix, 281, 1897.

Indistinguishable from *pinifoliae* except by the lobes of the pygidium of the female. The median lobes are small, narrowly rounded and diverging, forming a notch in the margin of the pygidium.

Occurs on *Pinus heterophylla* and *P. mitis* in Florida, and has been recorded from Rhode Island on *P. sylvestris*.

C. salicis-nigrae (Walsh), erroneously *salicis*, an European species.

Rept. Ins. Ill., i, 40, 1868.

Scale of female: Length 2.5-4 mm.; white, exuviae yellowish brown, elongated pyriform, broadest near the middle, distinctly convex.

Female: Median lobes short, broadly rounded, entire or faintly serrate. Median group of circumgenital gland-orifices 21-36; anterior lateral, 31-45; posterior lateral, 28-32.

Scale of male: Length 1-1.2 mm.; white, exuviae brown or nearly colorless, sides parallel, slightly broadened posteriorly, distinctly but feebly tricarinated.

The usual host plants are poplar and willow, but this scale is found occasionally on *Liriodendron*, *Cornus* and *Amelanchier*.

Recorded from Massachusetts and New York.

Another species, *C. spartinae* Comstock, has been recorded from Massachusetts. Specimens and description are not available.

Hemichionaspis Cockerell.

Only one species of this genus has been recognized in our territory and this is usually found on the leaves of plants in greenhouses.

H. aspidistrae (Signoret). *Chionaspis aspidistrae*. *Chionaspis brasiliensis*. *Chionaspis latus*. (Pl. xv, 2.)

Ann. Soc. Ent. Fr., ix, 443, 1869.

Scale of female: Length 1.8-2.6 mm.; pale brown exuviae of same color; rather broadly pyriform with posterior extremity well rounded.

Female: Median lobes with three notches on outer margins. Median group of circumgenital gland-orifices 5-15; anterior lateral 15-22; posterior lateral 17-23.

Scale of male: Length 1-1.3 mm.; white, exuviae bright yellow, sides parallel, tricarinated.

On orchids, ferns and tropical plants in greenhouses.

Milford, 12 March, 1909, 2 Feb., 1922; Cromwell, 19 Jan., 1910.

Diaspis Costa.

Female scale nearly circular, white or light gray, exuviae nearly central, or at least well within the margin. Only one species (*samiae*) is without circumgenital gland-orifices, and one (*echinocacti cacti*) has a male scale which is not tricarinate.

Key to Species.

1. Pygidium of female with five groups of circumgenital gland-orifices 2
Pygidium without grouped circumgenital gland-orifices*zamiae*
2. Inner margins of median lobes serrate 3
Median lobes small; not serrate 4
3. Thoracic segment with large projecting tubercle on either side;
median lobes diverging; large inner margins strongly curved,
sharply serrate*boisduvalii*
Thoracic tubercle wanting; median lobes smaller diverging, inner
margins nearly straight, serrate*bromeliae*
4. Posterior group of circumgenital gland-orifices usually of more
than twelve*echinocacti cacti*
Posterior group of circumgenital gland-orifices usually from seven
to nine*carueli*

D. boisduvalii (Signoret).

Ann. Soc. Ent. Fr., ix, 432, 1869.

Scale of female: Diameter 2 mm.; white or light gray, nearly circular, sometimes slightly elongated. Exuviae large, darker, nearly central.

Female: Thoracic segment prolonged at each cephalo-lateral angle to form a large tubercle. Median lobes large, separate at base, divergent, inner margins strongly curved and sharply serrate. Median group of circumgenital gland-orifices 8-16; anterior lateral 20-28; posterior 15-18.

Scale of male: Length .75-1 mm.; white, and distinctly tricarinate, usually massed in large numbers, and covered with woolly filaments.

On palms, orchids, etc., in greenhouses. Recorded from Canada, New York and Massachusetts.

New Haven, 27 Feb., 1906.

D. bromeliae (Kerner).

Naturg. Ins., 20, 52, 1778.

Scale of female: Diameter 2.25-3 mm.; nearly circular, flat convex, whitish semitransparent, sometimes covered or partially covered with scurfy epidermal layer of host; exuviae near the margin, varies from yellow to pale brown.

Female: Similar to *boisduvalli*, but without tubercles at cephalo-lateral angles of thoracic segment of body and pygidium with much smaller median lobes which diverge, their inner margins nearly straight and sharply serrate; median group of circumgenital gland-orifices, 8-9; anterior lateral, 14-20; posterior lateral, 13-17.

Scale of male: .75-1 mm., white and tricarinated, resembling male of *boisduvalli* but having a less number of woolly filaments, and the exuviae are darker.

Occurs on *Bromelia*, *Hibiscus*, pineapple and other plants in greenhouses; is an important pest of pineapples where they are grown.

Has been recorded from Massachusetts; though without definite records, it probably occurs in Connecticut.

D. carueli Targioni-Tozzetti. Juniper scale.

Catalogue Cocc., 43, 1869.

Scale of female: Diameter .75-1.75 mm.; average 1 mm., nearly circular, irregularly pyriform, very convex; white or dirty gray, often covered with a sooty deposit; exuviae inside the margin, pale yellow or colorless.

Female: Median lobes small, separated, parallel, entire or faintly notched or scalloped, not serrate. Median group of circumgenital gland-orifices, 5-8; anterior lateral, 10-13; posterior lateral, 7-9.

Scale of male: Length .75 mm., white, tricarinate, the central carina strongest, exuviae pale yellow.

Recorded from New York and Massachusetts, on juniper and arbor vitae.

Danbury, 4 Aug., 1917, on *Juniperus virginiana*.

D. echinocacti Bouché var. **cacti** Comstock. *calyptroides*. Cactus scale. (Pl. xv, 1.)

Second Rept. Dept. Ent., Cornell Univ., 91, 1883.

Scale of female: Diameter 1.5-1.7 mm., white or light gray, nearly circular, exuviae dark brown, nearly central.

Female: Median lobes small with margins wholly entire, rounded, slightly diverging. Median group of circumgenital gland-orifices, 6-13; anterior lateral, 16-22; posterior lateral, 12-18.

Scale of male: White, unicarinate, exuviae yellowish to brownish.

On plants of the family Cactaceae in greenhouses.

West Hartford, 4 Jan., 1916.

D. zamiae Morgan.

Ent. Mon. Mag., xxvi, 44, 1890.

Scale of female: Diameter 1.5-2 mm., circular or approximately so, strongly convex, whitish wax-like. Exuviae subcentral, yellowish.

Female: Median lobes widely separated, divergent, finely and widely serrate. May be distinguished from other closely related species by the large bifurcated plates. There are no groups of circumgenital gland-orifices.

Male unknown.

On *Zamia* and *Cycas revoluta* in greenhouses. Recorded from New York and Massachusetts and will probably be found in Connecticut.

Epidiaspis Cockerell.

E. piricola (Del Guercio). *Diaspis piricola*. *Diaspis ostreaeformis*. *Aspidiotus piricola*. Italian pear scale.

Il Natur. Sicil., 142, 1894.

Scale of female: Diameter 1.5 mm., circular, light gray, flattened, exuviae covered by a film of secretion and inconspicuous, but when film is rubbed off it is shiny and orange-brown in color.

Female: Median lobes orange-brown (other lobes colorless) large and prominent, rounded. Median group of circumgenital gland-orifices, 8; anterior lateral, 13; posterior lateral, 8.

On pear and plum. Found under edges of rough bark on pear twig.

New London, 15 March, 1902.

Aulacaspis Cockerell.

The species of this genus were formerly included under *Diaspis*, and are now placed there by some authors who do not regard *Aulacaspis* as being distinct. Female scale nearly circular, white, the exuviae near the margin. Pygidium with five groups of circumgenital gland-orifices. Scale of male strongly tricarinate.

Key to Species.

Median lobes with both margins free; lateral groups of circumgenital gland-orifices well separated **pentagona**
 Median lobes with only the inner margins free; lateral groups of gland-orifices almost continuous **rosae**

A. pentagona (Targioni-Tozzetti). *Diaspis pentagona*. *Diaspis amygdali*. *Diaspis lanatus*. West Indian peach scale. (Pl. xiv, 9.)

Revis. di Bacchic., 11, 1885.

Scale of female: Diameter 1.75-2.75 mm., opaque, white, nearly circular, convex; exuviae yellow near margin.

Female: Median lobes large, slightly separated at base, round-pointed, both margins free and deeply and coarsely notched. Five large groups of circumgenital gland-orifices, varying in number but the groups well separated; median, 6-13; anterior lateral, 14-32; posterior lateral, 12-30.

Scale of male: Length .75-1 mm., white, faintly tricarinate.

On various species of *Prunus* from Japan, and many other hosts. It has been found in Connecticut on Chinese privet, *Ligustrum ibota*, lilac, *Catalpa bungei* and cherry.

Greenwich, 21 Oct., 1913, 27 Oct., 1914, 26 Sept., 1916, 8 Oct., 1917; New London, 18 Apr., 1914; New Haven, 6 Aug., 1917.

A. rosae (Bouché). *Diaspis rosae*. (Pl. xiv, 8.)

Naturl. Ins., 14, 1834.

Scale of female: Diameter, 2-3 mm., snowy-white, sometimes yellowish, exuviae usually near margin, yellowish.

Female: Median lobes large, slightly separated, widely divergent, inner margins free and finely serrate. Lateral groups of circumgenital gland-orifices almost continuous; median group 18-22; anterior lateral, 25-32; posterior lateral, 26-34.

Scale of male: Length 1.25-1.5 mm., white and tricarinate.

Common throughout the state on rose, raspberry and blackberry.

Groton, 13 Aug., 1900; Clintonville, 23 Apr., 1902; Danielson, 21 Nov., 1902; New Haven, 14 June, 1903, 28 Apr., 1906, 5 Apr., 1907, 5 Dec., 1909, 6 Aug., 1917, 20 Aug., 1919; Plantsville, 22 Apr., 1903; Berlin, 20 Nov., 1917; Yalesville, 1 Feb., 1905; Simsbury, 18 Apr., 1905, 14 Apr., 1917; Norwich, 25 March, 1907, 28 Aug., 1909; South Manchester, 3 Aug., 1909; Rockville, 22 Dec., 1909; Bristol, 12 Apr., 1910; Greenwich, 7 Nov., 1910; Uncasville, 4 Aug., 1911; Hartford, 2 July, 1914, 30 Oct., 1917.

Pinnaspis Cockerell.

Only one species occurs within the region covered by this paper and that probably passes as oyster-shell scale.

P. buxi (Bouché). *pandani*.

Stett. Ent. Zeit., xii, 111, 1851.

Female scale: 1-1.5 mm. long, brown, varying from light to dark.

Female: Median lobes of pygidium small and narrow; inner margins entire, approximate, outer margins irregularly notched. Median group of circumgenital gland-orifices, 4; anterior lateral, 9-12; posterior lateral, 11-13.

On box, *Buxus sempervirens*, and a number of greenhouse plants.

Though not definitely recorded, it probably occurs in Connecticut, and has been recognized in Massachusetts and New York.

Leucaspis Targioni-Tozzetti.

Only one species of this genus occurs in our region and this has been discovered here recently. The female scales resemble those of *Lepidosaphes* though somewhat shorter and broader. The male scales are elongated, whitish but not carinated.

L. japonica Cockerell. (Pl. xv, 3.)

Psyche, viii, 53, 1897.

Scale of female: Length 1.5-2 mm., about the same color as bark.

Scale of male: Length 1.25-1.75. Whitish, exuviae brown, without carinae.

On Norway and silver maple and California privet.

Greenwich, 8 Dec., 1914; Stamford, 27 Oct., 1914.

Fiorinia Targioni-Tozzetti.

Scales of the females in this genus are formed almost wholly of the exuviae, which are terminal; scales of males resemble those of *Chionaspis*. A single species is found in our region on greenhouse plants.

F. fioriniae (Targioni-Tozzetti). *Diaspis fioriniae*. *Fiorinia camelliae*.

Studii Sul Cocc., 14, 1867.

Scale of female: Length 1-1.25 mm. Yellowish brown with white margin; elongated, narrowest at extremities, sides straight or slightly curved, dorsum usually with a high, rounded, dark brown keel or ridge, with sloping parallel sides, more or less wrinkled.

Female: Caudal margin deeply notched, the median lobes confluent at base but widely diverging from the margins of this notch; these lobes are serrate on the inner free margins. There are five groups of circumgenital gland-orifices, the median being continuous with the anterior laterals, the posterior laterals separate and arranged in a double row; median about 9; anterior lateral, 9-12; posterior lateral, 12-16.

Scale of male: Resembles that of female but smaller.

On palms, ferns and many other plants in greenhouses. Probably occurs in Connecticut though definite records are not at hand.

Aspidiotus Bouché.

Female scale nearly circular, slightly to strongly convex. Exuviae nearly central forming a nipple; secretory covering either thin and transparent or thick and opaque, easily rubbing off from the nipple showing the color of the exuviae. Male scale usually oblong-ovate, resembling female in color and texture.

Key to Species.

1. Pygidium of female without groups of circumgenital gland-orifices 2
Pygidium of female with groups of circumgenital gland-orifices present. 3
2. Only one pair of lobes, notched on each margin *ulmi*
More than one pair of lobes; median lobes notched only on outer margins *pernicius*
3. Gland-orifices arranged in four groups 4
Gland-orifices arranged in five groups 8
4. Median lobes notched on both outer and inner margins 5
Median lobes notched only on outer margins *comstocki*
5. Median lobes large and prominent 6
Median lobes small, separated *abietis*
6. Median lobes longer than broad 7
Median lobes as broad as long *cyanophylli*
7. Median lobes narrow, parallel, converging *hederae*
Median lobes almost trilobed *brittannicus*
8. Median lobes notched on outer margins only, sometimes entire 9
Median lobes notched on both outer and inner margins *uvae*
9. Median lobes rather broad, or distinctly converging 10
Median lobes narrow, inner margins nearly parallel 11
10. Median lobes notched near tips; second lobes narrow two- or three-notched on outer margin, chitinous processes rather small and straight *juglans-regiae*
Median lobes notched near middle; second lobes narrow, notched on outer margin; chitinous processes larger and curved or twisted *forbesi*
11. Median lobes long, entire, or roundly notched on outer margins; second and third lobes rudimentary *osborni*
Median lobes notched on outer margin, second lobes broader than and half the length of the median lobes, wavy, on apical margin *ostreaeformis*
Median lobes rather short, somewhat separated, notched on outer and occasionally on inner margins, second lobes not projecting beyond margin of pygidium *ancylus*

A. abietis (Schrank). Hemlock scale.

Beitr. Z. Naturg., 48, 1776.

Scale of female: Length 2-3 mm., dark gray, varying from nearly circular to elongate with ends rounded; exuviae subcentral, orange.

Female: Median lobes separated, small and variable; both inner and outer margins notched; rounded apically; two pectinae between the median lobes. There are four groups of circumgenital gland-orifices; anterior lateral, 9-11; posterior lateral, 5-6.

Scale of male: Length 1.4 mm., similar to scale of female, though smaller and darker.

On hemlock.

Norwalk, 13 Mar., 1906 (W. E. B.); New Haven, 31 Jan., 1913.

A. ancylus (Putnam). *Diaspis ancylus*. Putnam's scale.

Trans. Ia. Hort. Soc., xii, 321, 1877.

Scale of female: Diameter 1-1.5 mm., dark gray or black, with lighter gray margin; exuviae subcentral, brick red, covered with a gray excretion which is easily removed by rubbing. The scales often occur in clusters, and when crowded are more or less irregular.

Female: Median lobes large, well developed, well separated, the inner margins parallel, usually entire, occasionally notched, the outer margins notched. There are two pectinae between the lobes. The five groups of circumgenital gland-orifices are as follows: median, 2-3; anterior lateral, 6-10; posterior lateral, 4-9.

Scale of male: Length 1-1.5 mm.; of same color as female scale, but smaller and more elongated.

Though not an important pest, this scale is fairly common on peach, cherry, currant, birch, beech, maple, and many other host trees.

New Haven, 19 Dec., 1899; 11 Apr., 1900; 11 Mar., 1901; 19 Apr., 1902; 20 Jan., 1906; Norwalk, 3 Nov., 1900; 7 Mar., 1901; Ansonia, 2 June, 1902; Storrs, 1 May, 1906.

A. brittanicus Newstead.

Ent. Mon. Mag., xxxii, 279, 1896.

Scale of female: Diameter 1.75-2 mm., dusky ochreous, with a broad, smoky brown central zone, moderately convex; exuviae subcentral, orange-yellow. Scales easily detached from host plant.

Female: Median lobes emarginate, or notched on both outer and inner margins, giving them a trilobed appearance. Second pair of lobes nearly as large as median and of similar shape. There are usually four groups of circumgenital gland-orifices, rarely a median group of 2-3; anterior lateral, 7-10; posterior lateral, 7-8.

Scale of male: Similar to scale of female, nearly circular, ovate or elongate, fulvous.

This species has been recorded from Massachusetts, and is found on holly and *Ruscus hypoglossum*.

A. comstocki Johnson.

Ent. News, vii, 151, 1896.

Scale of female: Length 1.5-2 mm., elongated or almost semi-circular, depending upon its position on leaf; buff with exuviae varying from yellow to reddish brown.

Female: There are two pairs of lobes, the second pair often as long as, or longer than the median pair, both pairs notched on the outer margin near the tip; the median lobes may be notched on both outer and inner margins. There are four groups of circumgenital gland-orifices, anterior lateral about 6; posterior lateral, 4.

Scale of male: Length 1 mm. cream buff or grayish white, elongate oval, exuviae submarginal.

This species is found on maple and has been recorded from New York and Ohio.

A. cyanophylli Signoret.

Ann. Soc. Ent. Fr., ix, 119, 1869.

Scale of female: Diameter 1.5-2 mm., circular to ovate, brownish yellow exuviae central, bright yellow, covered by a white secretion.

Female: Median lobes very large, as broad as long, notched on both margins near apex. There are four groups of circumgenital gland-orifices; anterior lateral, 4-5; posterior lateral, 3-5.

Scale of male: Similar to that of female, but elliptical with exuviae subcentral.

On palms, orchids and various plants in greenhouses.

New Haven, 9 Jan., 1904.

A. forbesi Johnson. Cherry scale.

Ent. News, vii, 151, 1896.

Scale of female: Diameter 2 mm., circular, dirty gray, exuviae subcentral, covered, orange-red.

Female: Median lobes prominent, converging, almost meeting at tips, rounded apically and notched midway on outer margins. The number of circumgenital gland-orifices in the five groups are as follows: median, 1-4; anterior lateral, 4-7; posterior lateral, 3-5.

Scale of male: Length 1 mm., elongated, more convex and darker in color than female; exuviae in front of the center, orange-red.

On plum, cherry, peach, pear, apple, quince, currant, hawthorn, beech, honey locust, maple and walnut.

This species was brought into Connecticut on nursery stock.

New Canaan, 8 Nov., 1899; Plainville, 14 Feb., 1902; New Haven, 9 Dec., 1903.

A. hederæ (Vallot) *nerii* Bouché. Oleander scale. White scale.
(Pl. xv, 5.)

Mem. Acad. Dijon, 30, 1829.

Scale of female: Diameter 1.5-2 mm., nearly circular, flat, dirty white or light gray, exuviae central or subcentral, dull orange.

Female: Median lobes notched on both outer and inner margins near the tips. The number of circumgenital gland-orifices in the four groups are as follows: anterior lateral, 8-9; posterior lateral, 6-7.

Scale of male: Length 1 mm. Elongated slightly, white, exuviae subcentral, light yellow.

This is a common scale on a great variety of plants in the greenhouse.

New Haven, Dec., 1899, 19 Dec., 1901; 5 May, 1914; Hartford, 18 Apr., 1905; Glenbrook, 11 Sept., 1913; Cromwell, 5 Dec., 1913.

A. juglans-regiae Comstock. English walnut scale.

Rept. U. S. Dept. Agr., 300, 1880.

Scale of female: Diameter 2.8-3 mm., circular, flat, pale grayish brown, exuviae subcentral, reddish brown.

Female: Median lobes large and well developed, close together, converging, notched on outer margins, near apex, rounded. The five groups of circumgenital gland-orifices are as follows: median, 4-7; anterior lateral, 8-15; posterior, 6-10.

Scale of male: Length 1-1.25 mm., elongated, smaller than female but similar in color; exuviae at anterior end.

This species is found on walnut, apple, pear, peach, cherry, apricot, plum, locust and maple. It has been recorded from Massachusetts and probably occurs in Connecticut.

A. osborni Newell and Cockerell.

Rept. Ia. Acad. Sci., v, 229, 1898.

Scale of female: Diameter 1-1.25 mm., subovate, dark gray or brown, nearly the same color as the bark of the host; exuviae rather large, dark brown, or when rubbed, yellowish orange.

Female: Median lobes well developed, long and narrow, rounded apically, notched on outer margin; second and third lobes rudimentary; circumgenital gland-orifices grouped as follows: median, 0-2; anterior lateral, 5-7; posterior lateral, 3-4.

Scale of male: Same color as female but longer and narrower.

On white oak, *Quercus alba*, and hop-hornbeam, *Ostrya virginica*.

Greenwich, 23 Sept., 1914.

A. ostreaeformis Curtis. Pear tree oyster scale. European fruit scale.

Gardener's Chronicle, iii, 805, 1843.

Scale of female: Diameter 1-1.5 mm., circular, dark gray, lighter near margin, moderately convex; exuviae large, eccentric, yellow or orange.

Female: Median lobes short and broad, outer margin notched, apex rounded, less prominent than in *ancylus*. Median group of gland-orifices, 5-8; anterior lateral, 10-12; posterior lateral, 10-12.

Scale of male: Smaller than female, similar in color, exuviae submarginal.

This is an European species which has been brought into the United States, and is found on most kinds of fruit trees and a number of forest and shade trees. It has been found on nursery stock brought into Connecticut.

New Canaan, 20 Nov., 7 Dec., 1899.

A. perniciosus Comstock. San José or Pernicious scale. (Pl. xv, 4.)

Rept. U. S. Dept. Agr., 304, 1880.

Scale of female: Diameter 1-2 mm., circular, slightly convex, varies from light to dark gray; exuviae pale yellow, nipple-like, with a depressed zone surrounding them.

Female: Median lobes prominent, converging, rounded at apex and notched on outer margin near the middle. There are no groups of circumgenital gland-orifices.

Scale of male: Darker than female, more convex, sometimes elongated with nipple-like prominence and depressed ring more conspicuous than in the female.

This is an Asiatic species accidentally introduced into the western United States more than forty years ago, and first discovered in Connecticut in 1895. It spread very rapidly and for ten or fifteen years threatened the orchards of the state. Many peach orchards were destroyed by it before the owners learned to control it by spraying with the lime-sulphur wash. Now it is being held in check locally by a chalcidid parasite, *Prospaltella perniciosi* Tower.

In the office of the State Entomologist there are records from more than 400 localities in Connecticut, including about 150 towns and all parts of the state.

A. ulmi Johnson.

Bull. Ill. St. Lab. Nat. Hist., iv, 388, 1896.

Scale of female: Diameter 1.5-2 mm., circular, dirty white or buff, exuviae yellow.

Female: Only one pair of lobes, notched on each side, apex somewhat rounded. There are no regular groups of circumgenital gland-orifices present, though in some specimens from one to three are in place of the posterior laterals.

Scale of male: Length .7 mm., more or less circular or somewhat elongate, of same color as female.

Found on the trunks and larger branches of the American elm, especially on the smoother and thinner bark between the plates of outer bark. Also found on catalpa.

New Haven, 7 Oct., 1900; Bristol, 30 Mar., 1914.

A. uvae Comstock. Grape scale.

Rept. U. S. Dept. Agr., 309, 1880.

Scale of female: Diameter 1.5 mm., circular, rather flat, light

brown, exuviae subcentral, bright yellow. Scale of lighter color than dry bark of host.

Female: Median lobes large and prominent, rather close, nearly parallel, prominently notched on both outer and inner margins, apex rounded; inner notch slightly nearer apex than outer notch. Median group of circumgenital gland-orifices, 0-4; anterior lateral, 4-9; posterior lateral, 3-7.

Scale of male: Length 1 mm., elongated, slightly more convex and darker than female. Exuviae submarginal.

On grape; not yet recorded from Connecticut.

Chrysomphalus Ashmead.

The species of this genus were formerly included under *Aspidiotus* but differ in the shape of the female and in the presence of much elongated, chitinous thickenings or processes extending forward from the bases of the lobes. Of the four species here listed, three are tropical and occur in greenhouses or on tropical fruits in the markets.

Key to Species.

1. Circumgenital gland-orifices present; three pairs of well-developed lobes 2
Circumgenital gland-orifices absent; three pairs of well-developed lobes **aurantii**
 2. Four groups of gland-orifices; scale of female dark reddish brown 3
Five groups of gland-orifices; scale of female colored like bark of host, exuviae jet black **obscurus**
 3. Scale of female very convex, almost conical; exuviae gray; chitinous processes linear, nearly straight **aonidum**
Scale of female broadly convex, reddish brown, exuviae gray; chitinous processes clavate, more or less curved **dictyospermi**
- C. **aonidum** (Linnaeus). *Chrysomphalus ficus*. *Aspidiotus ficus*. *Coccus aonidum*. Fig scale. Circular scale. (Pl. xv, 6.)

Syst. Nat., Edn. 10, i, 455, 1758.

Scale of female: Diameter 2 mm., circular, strongly convex, reddish to dark brown; exuviae gray, nipple-like, highly raised from surface of leaf; appearing almost as if pointed like a low or flattened cone.

Female: Median and second lobes abruptly narrowed distally, notched on outer margins; third pair of lobes with two or three notches on outer margins; paraphyses or chitinous processes nearly straight, the central pair small, nearly parallel, all other pairs converging toward their distal extremities. Four groups of circumgenital gland-orifices arranged as follows: anterior lateral, 7-8; posterior lateral, 3-4.

Scale of male: Similar to that of female, though much smaller and with posterior gray flap.

On *Ficus*, palm, oleander, citrus trees, and many other kinds of greenhouse plants. It has been found on *Ilex crenata* from Japan.

New Haven, 3 Dec., 1901; Cromwell, 10 Oct., 1902; 29 Nov., 1909.

C. aurantii (Maskell). *Aspidiotus aurantii*. Orange red scale. N. Z. Trans., xi, 199, 1878.

Scale of female: Diameter 2 mm., circular, light gray, translucent, showing reddish insect beneath; convex, central exuviae, nipple-like, similar to *aonidium* but more flattened.

Female: Body orange or reddish brown, reniform in shape; median and second lobes notched on both sides, third lobes notched on outer margins only. There are no circumgenital gland-orifices.

Scale of male: Resembles that of female, but much smaller, with a long thin posterior flap.

This species is found chiefly on citrus trees in greenhouses, though many other kinds of plants are infested. Common on oranges and lemons in the market.

New Canaan, Jan., 1900.

C. dictyospermi (Morgan). *Aspidiotus dictyospermi*. Morgan's scale.

Ent. Mon. Mag., xxv, 352, 1889.

Scale of female: Diameter 1.25-1.4 mm. Circular, except when against a vein the shape may be modified; color light gray or yellow, with grayish central nipple surrounded by a dark depressed area, the latter bordered by a grayish ring. Exuviae central, light yellow to orange.

Female: Of the three pairs of lobes all similarly notched on the outer margins, the median lobes are the largest. There are four groups of circumgenital gland-orifices, with an occasional orifice in the place of a median group, arranged as follows: anterior lateral, 2-4; posterior lateral, 2-3. The five pairs of chitinous processes are clavate, about equal in size, and more or less curved.

This species is a common pest of palms in greenhouses, and also attacks a great many other kinds of plants.

New Haven, 9 Jan., 1904; Cromwell, 24 Feb., 1906.

C. obscurus (Comstock). *Aspidiotus obscurus*.

Rept. U. S. Dept. Agr., 303, 1880.

Scale of female: Diameter 2.5-3 mm., usually circular though somewhat irregular; dark gray but usually the same color as the bark; exuviae black and slightly concentric.

Female: Median lobes entire, almost pointed on inner margins near tips, but broadly and obliquely rounded on outer margins; second and third pairs serrate on outer margins. There are eight pairs of short clavate paraphyses or chitinous thickenings varying in size. The number of circumgenital gland-orifices in the five groups are arranged as follows: median, 3-9; anterior lateral, 9-13; posterior lateral, 2-6.

This species occurs on oak and hickory.

Sound Beach, 10 May, 1918.

Lepidosaphes Shimer.*Mytilaspis* Signoret.

Scale of female elongated, secreted posteriorly, narrowest at anterior extremity where exuviae occur. Male scale similar though smaller. Pygidium of female usually with five groups of circumgenital gland-orifices.

Key to Species.

1. Female scale three to five times as long as broad; median lobes more or less pointed 2
 Female scale two or three times as long as broad; median lobes broad and prominent, notched on each margin 3
2. Female scale about five times as long as broad; median lobes distinctly pointed, the margins scarcely serrate *gloverii*
 Female scale about three times as long as broad; median lobes obscurely pointed, margins distinctly serrate *beckii*
3. Circumgenital gland-orifices 33 to 48 in number *ulmi*
 Circumgenital gland-orifices 15 to 32 in number *newsteadi*

L. beckii (Newman). *Mytilaspis citricola*. Purple scale.

The Entomologist, iv, 217, 1869.

Scale of female: Length 2.8-3.4 mm., brownish purple, long and slender, broadened posteriorly; exuviae somewhat lighter, scale often curved.

Female: Median lobes obscurely pointed with serrate margins. Second lobes are deeply incised, the outer lobule being much the smaller, the inner and larger lobule is notched or serrate, the outer smooth or serrate. Median group of circumgenital glands, 5-7; anterior lateral, 12-18; posterior lateral, 8-10.

Scale of male: Length 1.5 mm., of same color as that of female, but narrower and less curved.

This scale commonly infests citrus trees in the South and is frequently seen on oranges, lemons and grape fruit in our markets. It also attacks citrus trees in greenhouses.

Bozrahville, 24 Feb., 1902; New Haven, 21 Mar., 1910; Naugatuck, 17 Dec., 1910; Cromwell, 11 Mar., 1911; Meriden, 16 Apr., 1915.

L. gloverii (Packard). *Mytilaspis gloverii*. Glover's scale.

Guide to the Study of Insects, Edn. i, 527, 1869.

Scale of female: Very long and narrow, light yellow varying to dark brown.

Female: Median lobes abruptly narrowed on outer margins, then prolonged into points apically; margins scarcely serrate; second lobes longer and narrower. Arrangement of circumgenital gland-orifices: median, 5; anterior lateral, 11; posterior lateral, 5.

Scale of male: Similar to that of female but smaller.

On citrus trees and citrus fruits in our markets, often associated with *L. beckii*.

L. newsteadi (Sulc). *Mytilaspis newsteadi*. (Pl. xv, 7.)

Sitzb. K. Bohm. Ges. Wiss., No. xlix, 8, 19, 1895.

Scale of female: Length 1.5-2 mm., very broad posteriorly, gray with whitish margins, dull; exuviae yellowish brown. Sulc's description states "scale of the female also brown, but longer and with more parallel sides than in *pomorum*" (*ulmi*).

Female: Median lobes broad and prominent, well separated with straight and parallel sides, rounded apically with a distinct notch on each margin, though varying greatly; second pair smaller and the third pair rudimentary. Five groups of circumgenital gland-orifices, median 1-7; anterior lateral, 7-13; posterior lateral, 7-12.

Male: unknown.

On umbrella pine, *Sciadopitys verticillata*.

Hartford, 3 Feb., 1915.

L. ulmi (Linnaeus). *Mytilaspis pomorum*. Oyster-shell scale. (Pl. xv, 8; eggs, Pl. xix, 8.)

Syst. Nat., Edn. 10, 69, 1758.

Scale of female: Length 2.5-3 mm., brown, narrow, broadened posteriorly, shining; exuviae yellowish or yellowish brown.

Female: Median lobes are broad and prominent, well separated with straight and parallel margins, rounded apically with prominent notch on each margin. Second lobes with larger inner lobules, rounded apically, entire; third lobes rudimentary. Five groups of circumgenital gland-orifices; median, 9-12; anterior lateral, 15-21; posterior lateral, 9-15.

Scale of male: Similar to that of female except smaller.

This scale has long been considered a pest of apple orchards in the northern states, and it also attacks poplar, willow, lilac, ash, butternut, *Cornus* and many other trees and shrubs. It passes the winter in the form of white eggs under the female scales. These eggs are laid about October 1st and hatch about June 1st. Spraying with kerosene emulsion about June 10th will readily kill the young.

Occurs throughout the state. There are more than 250 records in the State Entomologist's office, representing nearly 100 towns.

Ischnaspis Douglas.

Scale very long and narrow, pygidium with peculiar lattice-like thickening, and three groups of circumgenital gland-orifices. Only one species occurs in our region and that is found in green-houses.

I. longirostris (Signoret). *filiformis*. *Mytilaspis longirostris*. Thread scale. (Pl. xv, 9.)

Bull. Soc. Ent. Fr., ii, xxxv, 1882.

Scale of female: Length 2-3 mm., extremely narrow; about

eight times longer than broad, sides parallel, straight or curved, shining black, margins grayish; exuviae terminal, black.

Female: Median lobes rounded or finely crenulate, situated within a broad shallow emargination. There are three groups of circumgenital gland-orifices with numbers as follows: median, 3; laterals, 4-6. The dorsal area of the pygidium is nearly covered with the lattice-like thickening of the dermis.

Scale of male: Length 1 mm., elongate; in color, form and exuviae resembles the anterior portion of the female scale.

On various species of palm and other kinds of plants in the greenhouse.

New Haven, 15 Jan., 1904 (W. E. B.).

Parlatoria Targioni-Tozzetti.

Pygidium of female with margin evenly and deeply crenulate, the three pairs of lobes being nearly uniform in size and shape; each lobe is evenly and deeply notched on outer and inner margin, giving it almost a trilobed appearance. There are four groups of circumgenital gland-orifices. Male scale not carinated, long and narrow.

Key to Species.

1. Female scale greenish yellow, gray, or pale brown 2
 Female scale black; cephalic segment with large tubercle; fourth
 lobes distinct *zizyphi*
2. Female scale approximately circular; fourth rudimentary lobes
 present *pergandii*
 Female scale elongated, pale greenish yellow; fourth rudimentary
 lobes absent *proteus*
 Female scale elongated, orange-yellow; exuviae yellow with blotch
 of bluish green *crotonis*

P. crotonis Douglas. *proteus* var. *crotonis*. *pergandii* var. *crotonis*.

Ent. Mon. Mag., xxiii, 242, 1887.

Scale of female: Length 1.5-2 mm., elongate ovate, or pyriform, flat convex; orange-yellow with green tinge; exuviae marginal, yellow with a posterior blotch of dark bluish green.

Female: Four groups of circumgenital gland-orifices with anterior lateral, 5-6; posterior lateral, 4-5.

Scale of male: Elongated, purplish brown, exuviae with dark bluish green central area, margin yellow.

On *Croton* wherever this plant is grown. Has been recorded from Massachusetts in greenhouses.

P. pergandii Comstock. Chaff scale.

Rept. U. S. Dept. Agr., 327, 1880.

Scale of female: Diameter 1.2-1.75 mm., gray or dirty white tinged with pale brown, semi-transparent. Nearly circular with

brown exuviae at one side but is sometimes elongated with exuviae at one end and covering one-third the length of the scale.

Female: Three pairs of well developed lobes and a rudimentary fourth pair; lobes broadest near middle, tapering anteriorly, deeply notched on both margins near apex. Four groups of circumgenital gland-orifices, each group consisting of about 7, but varying from 5-10.

Scale of male: Long and narrow, not carinated, light gray with darker terminal exuvia.

Common on orange and lemon trees in greenhouses and on the fruits in markets.

New Haven, 27 Feb., 1906.

P. proteus (Curtis).

Gardener's Chronicle, 676, 1843.

Scale of female: Length 1-1.9 mm., elongate ovate, usually narrowed posteriorly, sometimes pyriform, strongly convex, pale greenish yellow, subdorsal area often bright orange-yellow, with paler margins.

Female: Three pairs of lobes, well developed, subequal, strongly trilobate; fourth lobes absent and replaced by broad palmate plates. Four groups of circumgenital gland-orifices; anterior lateral, 5-7; posterior lateral, 4-5.

Scale of male: Length 9 mm., much elongated, sides parallel, dull yellowish brown; exuviae terminal, pale yellow, with dark green dorsum.

On citrus and other plants in greenhouses. Has been recorded from New York state.

P. zizyphi (Lucas). *Coccus zizyphus*.

Bull. Soc. Ent. Fr., i, xxviii, 1853.

Scale of female: Length 1.25-2 mm., very much elongated, black, opaque, with a narrow whitish supplementary secretion at posterior extremity. Exuviae black, terminal.

Female: Cephalic segment bears on either side a large projecting tubercle. Four pairs of lobes, three well developed and nearly equal; they are narrower than in *pergandii* or *proteus* and less strongly trilobate. The fourth lobes are narrow and pointed and about half the length of the third.

Scale of male: Length 1 mm., very elongate, sides parallel, light brown; terminal exuviae, black.

This scale is a native of Europe and occurs on orange, lemon, date palm and *Zizyphus*; often brought into the United States on imported fruit.

OTHER SPECIES.

In addition to the scale insects mentioned on the preceding pages, there are a number of species which have been reported from the northeastern United States and are mentioned here because they may be found in Connecticut. *Eriopeltis festucae* (Fonscolombe), known as the cottony grass scale, was observed in Maine¹ in 1904 and 1905, and has also been reported from Canada, Illinois, Indiana and Dakota. *Aspidiotus epigaeae* Marlatt was described in 1908² on trailing arbutus from Virginia and Ohio. The variety *japonica* Kuwana of *Fiorinia florinae* Targioni-Tozzetti, has been collected on hemlock in New York State and on Long Island.³ According to Mrs. Fernald's Catalogue of Coccidae, the following species have been recorded from Massachusetts: *Ripersia blanchardii* King and Cockerell, *R. flaveola* Cockerell, *R. kingii* Cockerell, *R. lasii* Cockerell, and *R. minima* Tinsley and Cockerell in ants nests; *Kermes andrei* King on oak; *Sphaerococcus sylvestris* Cockerell and King on white oak; *Pulvinaria cockerelli* King on *Spiraea*; *P. floccifera* Westwood; *Lichtensia viburni* Signoret; *Eulecanium pallidior* Cockerell and King; *Lecanopsis lineolatae* King and Cockerell; *Diaspis minima* Targioni-Tozzetti; *Aspidiotus cydoniae* Comstock var. *crawii* Cockerell; *A. fernaldi* Cockerell and *Chrysomphalus smilacis* Comstock: from New York and Massachusetts, *Eulecanium quercifex* Fitch, and from New York *Toumeyelli pini* King, and *Ripersiella maritima* Cockerell from Long Island, N. Y., on *Spartina*. As some of these species are doubtless synonyms, and there may be some question about the identification of others, a thorough review of the group is necessary to settle the matter. It is quite probable that several additional indigenous species of scale insects occur in Connecticut, though not yet brought to the attention of entomologists. It is also expected that a number of exotic species not included in this paper, like the greedy scale, *Aspidiotus rapax* Comstock, and the camphor scale, *Pseudaonidia duplex* Cockerell, may appear in our greenhouses wherever their host plants are grown. Since this paper was prepared, a fluted scale, apparently *Icerya purchasi* Maskell, on *Acacia*, has been sent to the station from a greenhouse in Farmington, Conn.

¹ Maine Agricultural Experiment Station, Bulletin No. 121, 1905.

² Bureau of Entomology, Technical Bulletin No. 16, page 21, 1908.

³ *Ibid.*, page 82.

Suborder Heteroptera.

*Key to Families.**

1. Antennae shorter than the head, generally concealed in cavities between head and thorax; metasternal orifices absent 2
Antennae as long as or longer than the head, exposed 8
2. Ocelli present; littoral species; not over 10 mm. in length 3
Ocelli absent; aquatic species 4
3. Antennae exposed; front legs similar to intermediate
OCHTERIDAE, p. 391
Antennae concealed; front legs raptorial NERTHRIDAE or
GELASTOCORIDAE, p. 392
4. Hind tarsi without two distinct claws (except *Plea* which is less than 3 mm. in length); front legs not raptorial in structure; moderate or small in size 5
Hind tarsi with claws; front legs raptorial 6
5. Head overlapping thorax dorsally; body flattened above
CORIXIDAE, p. 386
Head inserted in thorax; body convex above
NOTONECTIDAE, p. 404
6. Membrane reticulately veined; large in size 7
Membrane without veins; moderate in size .. NAUCORIDAE, p. 402
7. Apical appendages of abdomen long and slender, not retractile; hind legs not flattened NEPIDAE, p. 399
Apical appendages of abdomen short and flat, retractile; hind legs distinctly flattened, natatorial ... BELOSTOMATIDAE, p. 396
8. Head shorter than thorax including scutellum 9
Head as long as entire thorax, both elongated; body and appendages slender; aquatic, length about 11 mm.
HYDROMETRIDAE, p. 663
9. Claws of at least the front tarsi distinctly anteapical with terminal tarsal segment more or less cleft; aquatic, living on the surface 10
Claws all apical, last tarsal segment entire; aquatic and terrestrial forms 11
10. Hind femora extending much beyond apex of abdomen; intermediate and hind pairs of legs approximated, very distant from front pair; ocelli present, but sometimes very obscure; moderate in size GERRIDAE, p. 658
Hind femora not extending much beyond apex of abdomen; intermediate pair of legs about equidistant from front and hind pairs (except in *Rhagovelia*); ocelli obsolete or absent; moderate to minute in size VELIIDAE, p. 416
11. Antennae five-segmented 12
Antennae four-segmented, disregarding minute ring segments; (antenniferous tubercles of head should not be mistaken for segments, figs. 166, 167 and 169) 13
12. First and second segments of antennae thicker than the others; minute in size NAEOGEIDAE or HEBRIDAE, p. 675
First segment of the antennae thickened, second slender; margin of head carinate above insertion of antennae; moderate in size, rarely minute 32

* Arranged by Dr. H. M. Parshley.

13. Prosternum with a median longitudinal transversely striated or granulated stridulatory groove visible anterior to front coxae, receiving the tip of the rostrum; rostrum three-segmented, short and strong; length not less than 5 mm. 14
 Prosternum without a stridulatory groove; size large or small .. 15
14. Terminal segment of antennae thickened; front legs highly modified, stout, raptorial; moderate in size PHYMATIDAE, p. 692
 Terminal segment of antennae filiform (sometimes faintly divided into numerous small parts); front legs usually much like the others, though raptorial in function, sometimes somewhat thickened and spinous; large or small in size REDUVIIDAE, p. 677
15. Hemelytra closely reticulate in relief, membranous between the reticulations, more or less lace-like in appearance, size small 16
 Hemelytra not so reticulate, or absent; size large or small 17
16. Juga free, produced before apex of head, longer than tylus; hemelytra with a non-reticulate membrane, the rest reticulately punctate; one small species PIESMIDAE, p. 694
 Jugal not prominent, not longer than the tylus; head sometimes with dorsal anteriorly projecting spines; hemelytra of similar texture throughout, densely reticulate; numerous small species .. TINGIDAE, p. 695
17. Pronotum divided into three lobes; head contracted behind the eyes; hemelytra wholly membranous, with a few distinct longitudinal and cross veins; very minute and delicate forms ENICOCEPHALIDAE, p. 693
 Pronotum, head, and hemelytra otherwise constructed 18
18. Rostrum really or apparently three-segmented 19
 Rostrum four-segmented, first segment sometimes short 23
19. Body convex below, flat or slightly concave above; greenish in color; clavus membranous, similar in texture to the membrane, the latter without veins, corium somewhat thickened; small aquatic predatory species living generally on floating vegetation MESOVELIIDAE, p. 674
 Body usually very thin, flat above and below; when not distinctly flattened hemelytra are not constructed as above; color not greenish; terrestrial or riparian 20
20. Tarsi two-segmented; flattened species of moderate size living under dead bark ARADIDAE, p. 738
 Tarsi three-segmented 21
21. Ocelli present 22
 Ocelli absent; hemelytra always much reduced, without membrane; rather small parasitic species CIMICIDAE, p. 668
22. Hemelytra provided with a cuneus, membrane without long closed cells, sometimes without veins; sometimes brachypterous; small in size ANTHOCORIDAE, p. 665
 Hemelytra without a cuneus; membrane with four or five long closed cells; moderate or small in size SALDIDAE, p. 408
23. Ocelli absent 24
 Ocelli present, except in certain Lygaeidae which may be distinguished by the venation and ring structure 26
24. Membrane with two large cells at base from which extend about eight branching veins; hemelytra without a cuneus; rather large strong forms [PYRRHOCORIDAE]
 Membrane with one or two small cells at base, very rarely with longitudinal veins; cuneus distinct; rather small delicate forms 25
25. First segment of rostrum longer than broad, extending generally somewhat beyond posterior margin of head; membrane with two small cells at base or rarely one MIRIDAE, p. 422
 First segment of rostrum little or not longer than broad, extending

- posteriorly not farther than middle of eyes; membrane with one cellTERMATOPHYLIDAE, p. 665
26. Hemelytra without a cuneus, not Mirid-like; size large or small 27
Hemelytra with a cuneus; small Mirid-like forms[ISOMETOPIDAE]
27. Front legs not especially modified for grasping, generally much like the others, front femora sometimes thickened and armed with a few teeth; first segment of rostrum generally longer than wide 28
Front legs raptorial, the tibiae and usually the femora armed with rows of numerous closely set spines which interlock when the leg is flexed, front femora more or less thickened, the femoral spines sometimes replaced by closely set even setae; first rostral segment short, moderate in sizeNABIDAE, p. 670
28. Body and appendages not extremely slender, antennae otherwise constructed 29
Body and appendages extremely slender, linear; antennae geniculate, biclavate; eyes distant from base of head; moderate in size NEIDIDAE, p. 737
29. Membrane with numerous more or less anastomosing veins; antennae inserted high, usually above a line drawn from the middle of the eye to the anterior end of the buccula 30
Membrane with five usually simple veins; antennae inserted low on the side of the head, usually below or on such a line; moderate or small in size, sometimes brachypterousLYGAEIDAE, p. 708
30. Metasternal orifices distinct, placed farther outward; colors usually dark; generally over 10 mm. in length 31
Metasternal orifices generally obsolete, when present placed between intermediate and hind coxae near median line, with two diverging furrows running outwards; moderate or small in size CORIZIDAE, p. 751
31. Head much narrower and shorter than the pronotum; bucculae extending posterior to insertion of antennae; moderate or large in sizeCOREIDAE, p. 746
Head much larger proportionally, the part between the eyes wider than the scutellum; bucculae anterior to insertion of antennae; moderate in sizeALYDIDAE, p. 749
32. Scutellum generally large, covering almost the whole of abdomen, usually very convex; when scutellum is reduced in size and flattened, tibiae are strongly spinose 33
Scutellum generally moderate in size, more or less narrowed apically; scutellum rarely covering most of the abdomen, in which case, in our species, colors are bright and contrasting, or there is a prominent tooth just anterior to lateral angles of pronotum; tibiae not strongly spinose but sometimes bear very small spines or a more or less hair-like vestiture which may have a spinose appearance; moderate in size ...PENTATOMIDAE, p. 753
33. Tibiae thickly set with long strong dark colored spines; corium narrow, acute or rounded apically; moderate to minute in size .. CYDNIDAE, p. 776
Tibiae not strongly spinose; corium broad, obtuse at apex; moderate in sizeSCUTELLERIDAE, p. 781

Family CORIXIDAE.

By JAMES FRANCIS ABBOTT, PH.D.

The Corixidae are probably the most highly specialized of the Heteroptera—speaking in an evolutionary sense. The multitude of variations and the apparent plasticity of the species is likewise evidence of their relatively recent appearance on the earth. Representatives of the family are found in all parts of the world, although certain genera are restricted to various zoogeographical divisions. Of the twelve genera that are recognized, seven are to be found in North America, and of these three occur in Connecticut.

Corixids are to be found in shallow brooks, ponds and puddles, sometimes in streams so near the sea that the water is very brackish. They are as a rule strong flyers, and often migrate in great swarms from pond to pond. At such times they not infrequently come to the light. They swim through the water, back uppermost, in irregular rapid jerks, and as a rule spend the greater part of the time near the bottom, clinging to sticks or water-weeds. The cross-barred markings of the tegmina, characteristic of nearly every representative of the family, are doubtless of great value in aiding the insects to escape observation, on account of the consequent resemblance to the debris to which they cling.

Males and females are distinguished throughout the family by a number of striking morphological characters, the most remarkable of which is the asymmetrical structure of the abdominal segments of the males. On the dorsum of the latter there is also an organ of doubtful function (usually shaped like a curry-comb) called the "*strigil*" and the males likewise have the fore tarsi (or "*palae*") provided with one or two rows of chitinous "*pegs*" or teeth. By rubbing these back and forth over a roughened area on the femur of the other fore-leg, a twittering sound is produced. The females lack these pegs and the abdominal segments are perfectly regular. The front of the female is usually convex, that of the male, concave. The eggs are usually attached to water-weeds or to other debris and there are usually two or more broods in a season. The following keys are based largely on male characters, since the discrimination of isolated females is a matter of great difficulty and in most cases is possible only when large series are available for comparison.

In order to understand the descriptions, the accompanying sketch of one of our commonest species is included. See fig. 36.

Key to Genera.

1. Asymmetry dextral.* First tibia not produced over pala 2

* To the right of the observer (and of the insect) when the latter is looked at from above. The intromittent organ curves toward the asymmetrical side.

- Asymmetry and strigil sinistral.* First tibia produced over pala in the form of a spur **Corixa**, p. 390
2. Metathoracic wings present and functional 3
- Metathoracic wings rudimentary **Palmacorixa**, p. 390
3. Strigil absent **Callicorixa**, p. 390
- Strigil present, on the right side **Arctocorisa**, p. 387

Arctocorisa Wallengren.*Key to Species.*

1. Length 8 mm. or more 2
- Length less than 8 mm. 6
2. Lineations tending to coalesce into solid color or longitudinal series 3
- Lineations distinct, often confused but always transverse and completely covering the corium 5
3. Membrane with very obscure or no lineations 4
- Membrane with regular lineations somewhat like those of corium. Pronotum with 4-5 lines. Pegs 18 + 18 = 36. Margins of elytra parallel **ornata**
4. Length 8-9 mm. Markings heavy and often coalescent into solid black, which always covers the entire corium. Membrane smoky but without true lineations, and in sharp contrast to the rest of the tegmina. Corium bordered by yellow margin. Pegs 29-30. Sides of body parallel. Pronotum with 6-7 narrow lines **kennicottii**
- Markings coalescent, condensed to a mass of solid color in the inner angle of the corium. Embolium and outer margin of corium without lineations. Pronotum unicolorous or with 7-8 very narrow scratched lines. Pegs 22. Male pala, short ligulate. Body broadest in the middle **lucida**
5. Length 10-10.5 mm. Suture between corium and membrane rarely marked by color,—the lineations being continuous across the wings. Male pala ligulate. Pegs 26-30 **interrupta**
- Length 8-9 mm. Suture between corium and membrane usually marked by a yellow line. Male palae shorter in proportion to width than in *interrupta*. Pegs 21-24 **nitida**
6. Lineations of clavus usually broad and entire, in contrast to the confused and broken lines of the corium. Length 6-8 mm. 7
- Lineations of clavus, interrupted, of the same character as those of corium. Length 4-5.5 mm. 9
7. Pegs 30 or less 8
- Pegs 38-40 in a single curving row, tegmina dark in color and very rastrate† **alternata**
8. Markings of corium coalescent into 3 longitudinal stripes. Pala with 21-23 pegs. Length 6 mm. **trilineata**
- Corial markings confused and interrupted but not longitudinally seriate. Pegs 29-30. Length 7-8 mm. **parshleyi**
9. Pegs more than 20, in a curved row 10
- Pegs 17 in an angulated row **seriata**
10. Pegs 20-21 in an evenly curving row, midway the face of the pala **compressa**
- Pegs 25-26, following the upper margin of the pala **scabra**

A. interrupta (Say). (Pl. xvi, 2.)

Jour. Acad. Nat. Soc. Phila., iv, 328, 1825.

* Extending to the left.

† With the surface roughened in ridges like a file.

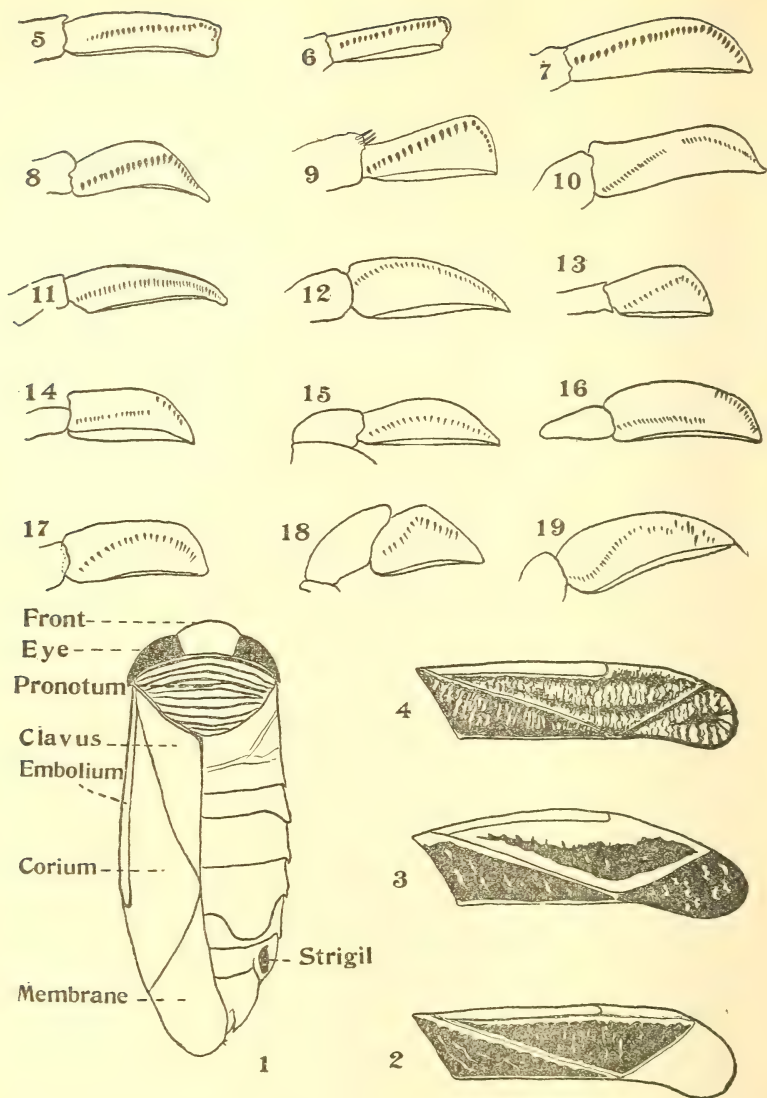


FIG. 36. Corixidae.* (1) *Arctocorisa interrupta* (Say),—sketch to illustrate structural parts of a Corixid. The right wing-cover has been removed and the lineations of the other one are omitted for the sake of clearness. (2) *Arctocorisa kennicottii* (Uhler),—right wing-cover. (3) *Arctocorisa lucida* Abbott,—right wing-cover. (4) *Arctocorisa ornata* Abbott,—right wing-cover. (5) *Arctocorisa interrupta* (Say),—fore tarsus of male. (6) *Arctocorisa nitida* (Fieber),—fore tarsus of male. (7) *Arctocorisa kenni-*

* Note: These illustrations show the comparative shapes and not the relative sizes.

The largest and commonest species in North America. A dimorphic male form (*harrissii* Uhler) is common in the Eastern United States. It differs from *interrupta* in the shape of the pala (see fig. 36; 5 and 8).

Hamden, 24 Oct., 1910 (B. H. W.); South Meriden, 19 Mar. (H. L. J.); Southington, 21 May, 1910 (B. H. W.); Fairfield, 15 July, 1904 (H. L. V.).

A. kennicottii (Uhler).

Trans. Md. Acad. Sci., i, 393, 1897.

Atlantic Coast States.

Hamden, 1 June, 1911 (B. H. W.); South Meriden, 27 Mar., 1914 (H. L. J.).

***A. lucida** Abbott.

Ent. News, xxvii, 341, 1916.

Type locality: Cheshire, 5 May, 20 Mar., 1911 (B. H. W.); New Haven, 22 Aug., 1913 (B. H. W.); Hamden, 1 June, 1911 (B. H. W.).

A. nitida (Fieber).

Spec. Generis Corisa, 28, 1851.

Characteristic of the Southern and Southeastern States. Occasionally found in New England. Often confused with *interrupta*.

New Haven, 22-30 June, 1912 (A. B. C.); 22 Aug., 1913 (B. H. W.).

A. ornata Abbott.

Ent. News, xxvii, 341, 1916.

Maine, New York, Connecticut.

Cheshire.

A. alternata (Say).

Journ. Acad. Nat. Sci. Phila., iv, 329, 1825.

A widely distributed species, very variable in markings.

Hamden, 24 Apr., 1911 (B. H. W.); New Haven, 22 June, 1910 (A. B. C.).

A. parshleyi Abbott.

Ent. News, xxvii, 342, 1916.

Found in Providence, R. I.

A. trilineata (Provancher).

Nat. Can., iv, 108, 1872.

A Canadian species, extending into New England.

Kingston, R. I.

cottii (Uhler),—fore tarsus of male. (8) *Arctocorisa interrupta*, form *harrissii* Uhler,—fore tarsus of male. (9) *Arctocorisa lucida* Abbott,—fore tarsus of male. (10) *Arctocorisa ornata* Abbott,—fore tarsus of male. (11) *Arctocorisa alternata* (Say),—fore tarsus of male. (12) *Arctocorisa parshleyi* Abbott,—fore tarsus of male. (13) *Arctocorisa seriata* Abbott,—fore tarsus of male. (14) *Arctocorisa trilineata* Provancher,—fore tarsus of male. (15) *Arctocorisa compressa* Abbott,—fore tarsus of male. (16) *Callicorixa praeusta* (Fieber),—fore tarsus of male. (17) *Arctocorisa scabra* Abbott,—fore tarsus of male. (18) *Corixa verticalis* (Fieber),—fore tarsus of male. (19) *Palmarcorixa buenoi* Abbott,—fore tarsus of male. Drawing by Dr. J. F. Abbott.

A. compressa Abbott.

Bull. Brook. Ent. Soc., viii, 83, 1913.

Southern States.

Hamden, 1 June, 1911 (B. H. W.).

A. scabra Abbott.

Bull. Brook. Ent. Soc., viii, 83, 1913.

Southern States.

Cheshire, 20 Mar., 1911, New Haven, 18 Mar., 1911 (B. H. W.).

A. seriata Abbott.

Ent. News, xxvii, 342, 1916.

Hamden, 21 Oct., 1910 (B. H. W.); New Haven, 6 May, 1904 (H. L. V.);
Cheshire, 20 Mar., 1911 (B. H. W.).

Corixa Geoffroy.**C. verticalis** Fieber.

Spec. Generis Corixa, 24, 1851.

First tibia produced in a spur over the strongly arched pala. Pegs in a sharply angulated row, 13-14 in number. Pronotal lineations delicate, 9-10 in number. Length 5 mm.

East River, 2 Aug., 1900 (C. R. E.); Branford, 28 Aug., 1905 (H. W. W.); Hamden, 1 June, 1911 (B. H. W.).

Palmacorixa Abbott.**P. buenoi** Abbott.

Can. Ent., xlv, 113, 1913.

A delicately marked, and very variable species. Found in New York, Georgia, and Massachusetts. Pegs variable in size, in an irregular row. Pala thin and plate-like. Pronotum impressed at each side.

Not recorded from Connecticut.

Callicorixa White.**C. praeusta** (Fieber).

Bull. Soc. Nat. Mosc., xxi, 521, 1848.

A common European species, found in the northern part of North America, straying into New England. Easily distinguished from all other American Corixids by the absence of strigil and the fact that the pala has the pegs in two rows. Not as yet recorded from Connecticut.

Family OCHTERIDAE.

(Pelagonidae.)

By J. R. DE LA TORRE-BUENO.

The family characters serve to separate this, the only genus of the family known so far in North America.

Ochterus Latreille.

(Pelagonus Latreille.)

These little semiaquatic bugs are dark in color, generally a velvety black with vague bluish markings on the elytra and flavous spots on the margins of the thorax and elytra. They live among the scanty grass and weeds about damp ground, such as the edges of ponds or streams. They are very quick and lively in their movements, making little abrupt flights from place to place, and skipping about unexpectedly. When undisturbed, they walk about quite steadily and sedately. The structure of their beak seems to indicate that they are predaceous by nature; and Uhler, by inference, indicates that they prey on the larvae of Diptera and other forms which habitually lie concealed in soft mud near the surface.

Formerly there was thought to be only one species in the East with a range from Massachusetts to Texas, but Mr. H. G. Barber has found three on the Atlantic seaboard, one of which, *Ochterus flaviclavus* Barber, so far as known is Floridian only. The other two species found in the Eastern States may be separated by means of the key.

Key to Species.

Anterior part of the tylus flattened; vertex wider than the width of one eye; eyes not very prominent; anterior angles of pronotum angularly truncate; prothorax more than two and one-half times as broad as long at the longest dimension; membrane of elytra well developed**americanus**

Anterior part of the tylus convex; vertex only as wide as the width of one eye; eyes noticeably prominent; anterior angles of pronotum regularly rounded; prothorax less than two and one-half times as broad as long at the longest dimension; membrane of the elytra narrow**banksi**

O. americanus (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., i, 335, 1876.

Most of the records of *Ochterus* are referred to this species, but it has been confounded with the following, therefore much doubt is attached to all. This species is found in New York, within six miles of the Connecticut line, so little effort will reveal it in this State.

O. banksi Barber. (Fig. 37.)

Can. Ent., xlv, 214, 1913.

The characters in the table easily differentiate this from the preceding species. Though its author states that it seems to approach the European *O. marginatus* Latreille, a comparison of the two species shows immediately notable differences in facies and markings, without considering the structural details.

This species, not heretofore recorded from Connecticut, is found not uncommonly in New York within a few miles of the Connecticut border.

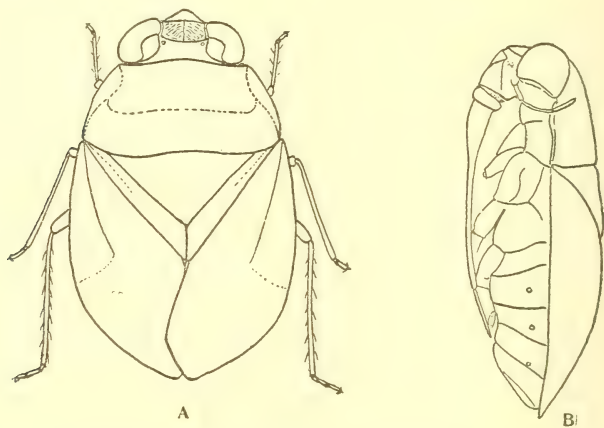


FIG. 37. *Ochterus banksi* Barber,—(a) dorsal view, (b) lateral view, greatly enlarged. Drawing by Dr. Philip Garman.

Family NERTHRIDAE.

(*Gelastocoridae*; *Galgulidae*.)

By J. R. DE LA TORRE-BUENO.

There is only one genus of this curious family in the East, represented by an uncertain number of undescribed species.

Gelastocoris Kirkaldy.

(*Galgulus* Latreille.)

The family characters serve to distinguish it. The species of the genus all have a peculiar shagreened mottled aspect. They are commonly called toad-bugs, on account of their markings, prominent eyes and squat shapes. So far as known, all frequent the shores of streams and ponds and some are found in bogs and marshes, hopping and running about the dryer parts, in chase of their prey.

The following key has been prepared from the type specimen of *G. barberi*; and from specimens from Raleigh, North Carolina,

of the form which by common consent is regarded as *oculatus* Fabricius. This is the first key for species of *Gelastocoris*; and is on a purely structural basis. Descriptions heretofore of the species of this genus, as of other waterbugs, have been by color largely. In color, this group is singularly variable yet, paradoxically enough, quite similar. When one gets the general color effect, it is characteristic for each species, but in every series of a species there are examples which approach in color others in a different species. The facies of *Gelastocoris* is also peculiar, but too elusive to put into words, as the peculiar or striking aspect of a species depends on a "more or less" description. If all, or a given species which has been used for comparison, are before a worker, no difficulty presents itself. But if he has only a single species, it is nearly impossible to determine it. Habitus is the key to species, but habitus strictly controlled by structural characters, many of which are still to be developed. No *Gelastocoris* seems as yet to have been found in Connecticut, although there seems to be no *a priori* reason for this failure.

Key to Species.

Front longer than broad. Eyes more prominent anteriorly and markedly inclined in that direction. Explanate margin of corium smooth, or at most imperceptibly wavy. Prominences on disk of thorax strongly marked, disk tumid. Posterior three-fourths of sides of pronotum rounded, convergent anteriorly, but not subtransverse. Anterior claws slightly longer than tarsus, tarsus with claws one-fourth shorter than tibia. Second joint of posterior tarsi nearly one-half longer than third. Mesosternal tongue broad, short, oblique. Hemelytra not passing tip of abdomen, rounded at apex; membrane reduced. Tubercles white on a dark variegated ground, producing a distinct dark and white clouding *barberi* n. sp.

Front as long as broad. Eyes somewhat inclined anteriorly, more prominent laterally. Explanate margin of corium crenulate. Disk of prothorax flattened; discal prominences not marked and somewhat linear in effect. Posterior three-fourths of sides of pronotum subtransverse, rounded. Anterior claws shorter than tarsus; tarsus with claws half as long as tibia. Second joint of posterior tarsi about one-third longer than third. Mesosternal tongue narrow, long, erect. Hemelytra passing extremity of abdomen, narrowed at apex; membrane normal. Tubercles white on a prevailing clay-yellow ground, which is sometimes clouded medially with black *oculatus*

G. oculatus Fabricius.

Ent. Syst. Suppl., 525, 1798.

This is the species reputed to occur in the Atlantic States but so far as the writer knows has not been taken as far north as New Jersey.

G. barberi Bueno, n. sp.

Front vertical, triangular, longer than broad, rounded at distal end; head with eyes broader than long; eyes pedunculate, reni-

form, markedly inclined anteriorly, with vertical indistinct dark stripes. Ocelli nearer to each other than to the eyes. Antennae concealed under the head. Rostrum short, stout, barely visible, reaching anterior coxae and concealed by them from the side; first segment shortest, ringlike, second longest, third conical, shorter. Prothorax more than two and one-half times as long as broad, anterior and posterior margins sinuate; anterior margin about as broad as head with eyes; disk tumid with distinct prominences; transverse indentation twice as far from anterior as from posterior margin; with an oblong median tumefaction, at each extremity of which is a large (compared with the others) black tubercle; posterior margin deeply indented above scutellum, longitudinally tumid, but somewhat smoother than disk; lateral margins broad, foliaceous, posterior three-fourths rounded and convergent anteriorly, faintly denticulate, anterior one-fourth subparallel but with a distinct anterior convergence, nearly straight, denticulate; anterior pronotal angles with nearly straight, smooth anterior margins; posterior pronotal angles more or less rounded; edges of prosternum granulate, but otherwise smooth, broadly triangularly projecting sternally, antero-lateral edge somewhat reflexed to cover coxae. First pair of legs shortest, femora very stout, shorter than tibia and tarsus taken together, grooved, edges of groove spinose; anterior coxae long, stout, nearly as stout as femora; tarsus seemingly one-jointed, shorter than long double slender anterior claws, which are longer than the claws of the other legs. Scutellum wider than long, tumid, with a trifid raised portion in lines.

Hemelytra with lamellate anterior corial margin with nearly smooth edges; clavus distinct, with a curved interior vein terminating posteriorly in a small group of white tubercles; corium with a single curved vein, evanescent medially; corium imperceptibly merging into the narrow membrane, which is veinless but reticulately wrinkled; the usual three single large white tubercles in the distal part of the corium in a broken line running out from the end of the clavus.

Second pair of legs longer than first; coxae large, femora about three times as thick as the tibiae, tapering distally; tibiae shorter than femora, of equal thickness throughout, tarsi seemingly one-jointed.

Mesosternum of equal width throughout, anterior and posterior margins subparallel, median tongue broad-triangular, sloping, rounded at tip, dentate.

Metasternum laterally triangular, produced posteriorly, leaving the margin of the fourth abdominal segment exposed as a triangle and the apex passing the suture between the third and fourth, broadly emarginate for the reception of the posterior coxae and triangularly projecting between them, edges dentate except at emarginations.

Hind legs longest, coxae large, like others; femora somewhat thicker than tibiae, not spined; tibiae longer than femora, with long setae; second tarsal joint nearly twice as long as third, claws not included.

Abdomen broad, five visible segments and the prominent male genital segment which is covered with long hairs; segments of

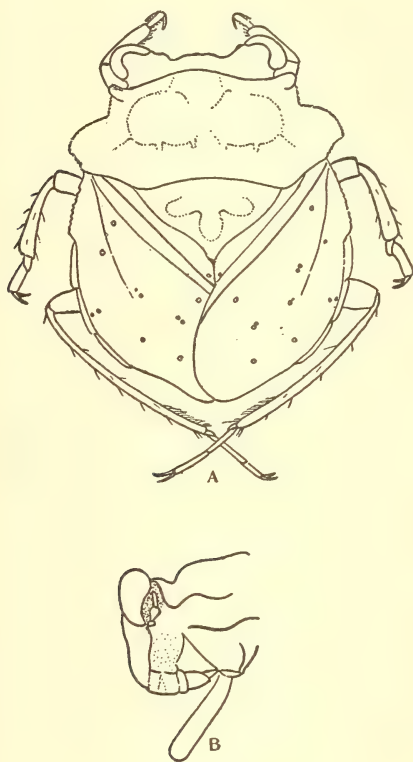


FIG. 38. *Gelastocoris barberi* Bueno, N. S.—(a) dorsal view, (b) lateral view of head; both greatly enlarged. Drawing by Dr. Philip Garman.

nearly equal width at connexivum, narrowing medially to allow for the compression by the large genital segment; posterior angles of the segments of the connexivum prominent, each with a marginal small tuft of gray hairs; edges with short black spines; abdomen beneath more or less sparsely long gray-pilose.

All legs, except as noted, with long black spines, and transversely striped with broad brown bands on a white or light ground. Sternal surface more or less granulate or tuberculate, except at

explanation of thorax, which is rugulose. Entire upper surface with a shagreened effect, produced by white tubercles of varying sizes on a parti-colored ground, in which black predominates varied with bronze and blue.

Length, 6.3 mm.; width, 5.1 mm., at corial expansion. See fig. 38.

Described from one male, from Muncie, Ill., October 16, 1915, collected by Dr. Philip Garman and now in his collection. Named in compliment to my friend, Mr. H. G. Barber, one of the collaborators in the present work.

This species approaches another undescribed Eastern form, frequently found in New Jersey and South, which, however, does not fall in either of the divisions in the preceding key.

Family BELOSTOMATIDAE.

By J. R. DE LA TORRE-BUENO.

Some of the individuals of this family are by far the largest of all the Heteroptera. In the Tropics its representatives attain the length of four to five inches, but with us the largest species, *Benacus griseus*, rarely reaches three inches. All live in water, hiding in vegetation and lying in wait for their prey, which consists of other insects, small fish, tadpoles, etc. In fish hatcheries they have been known to cause considerable losses by getting into the troughs and destroying the young fish. The larger forms, *Benacus* and *Lethocerus*, are known popularly as "electric-light bugs." The bright glare of this form of illumination seems to have a great attraction for them, and they are to be found on favorable nights helplessly flapping their wings in vain attempts to rise from the ground, or furiously whirling around the arcs to dash themselves dizzily to earth, there to kick and scramble. The smaller *Belostomas* have not to my knowledge been recorded under these conditions. Our native species have a striking peculiarity—while in the nymphal stage they have two claws on the anterior tarsi but at the last moult they shed them, to go through adult life with only one. All secrete a poisonous saliva, which is injected into their victims, rapidly narcotizing, and eventually killing them. In proportion to their size they are very strong, as any one can test by letting one grip a twig and then trying to get it away.

Key to Genera.

1. Anterior femora sulcate 2
 Anterior femora not sulcate *Benacus*
2. Large species; elongate; tylus not produced or bluntly prominent
 *Lethocerus*
 Small species; oval; tylus triangularly produced *Belostoma*

Benacus Stål.

There is only one known species of this genus, *B. griseus*, and the character of the non-sulcate anterior femora is sufficient to separate it from every other American representative of the family.

B. griseus (Say).

Desc. Het. Hem., p. 39, 1832.

(*haldemanus* Leidy.) Journ. Acad. Nat. Sci., Phila. (2) i, 66, 1847.

This species is recorded from Canada to Mexico and Cuba. Large specimens are the largest of our native Belostomatids. Little is known of its breeding habits, except that it lays its elliptical striped eggs around the stems of rushes. Its other habits have already been explained.

New Haven, 22 May, 1911 (A. B. C.); Meriden, 29 July, 1917 (J. S. Miller).

Lethocerus Mayr.

(*Amorgius* Stål. *Belostoma* Auctt. nec Latreille.)

Little more can be said about these species than about *Benacus*. The eggs are laid in masses under stones, planks or logs in wet places near their haunts. (See Pl. xix, 6.) The key suffices to separate them.

Key to Species.

1. Vertex narrowing anteriorly, sides of body slightly curved 2
Vertex parallel; sides of body nearly straight, subparallel **uhleri**
2. Vertex wider than the width of one eye; legs comparatively slender; prothorax not very stout; relatively small and slender insect (45 mm. long) **obscurus**
Vertex subequal to width of one eye; legs comparatively stout and long; prothorax stout; a relatively large and stout insect (50 mm. long or over) **americanus**

L. americanus (Leidy). (Pl. xvi, 4.) (Figs. 39, 40.)

Jour. Acad. Nat. Sci. Phila., vi, 58, 66, 1847.

New Haven, 27 Mar., 1909 (P. L. B.); 22 May, 1911 (A. B. C.); Lyme, 14 Sept., 1909 (C. H. Davidson); Cromwell, 9 Apr., 1919 (M. P. Z.); Hamden, 7 June, 1919 (K. F. C.); Cornwall, 16 May, 1920 (K. F. C.).

L. obscurus (Dufour).

Ann. Soc. Ent. Fr. (4) iii, 383, 1863.

Torrington (R. Hochstein).

L. uhleri (Montandon).

Ann. Soc. Ent. Belg., xl, 513, 1896.

It is doubtful if this species occurs in Connecticut, since it seems to range from New Jersey southward.

Belostoma Latreille.

(*Zaitha* Amyot and Serville: *Perthostoma* Leidy.)

The species of this genus are all more or less oval and smaller

in size than those of the other two. The eggs in all are glued by the female on the back of the male which carries them till they hatch. The three Connecticut species are readily separable by the following key.

Key to Species.

- | | |
|---|------------------|
| 1. Tylus not greatly produced | 2 |
| Tylus very prominent; body broad | <i>lutarium</i> |
| 2. Exceeding 22 mm. in length; body rather elongate; tylus moderately long | <i>flumineum</i> |
| Less than 22 mm. in length; body comparatively broad; tylus little produced | <i>testaceum</i> |

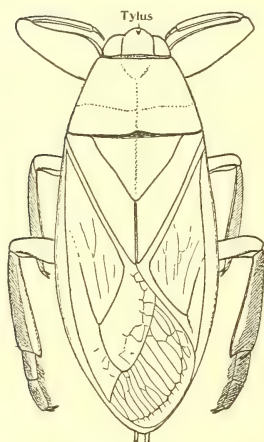


FIG. 39. *Lethocerus americanus* (Leidy),—dorsal view, natural size. Drawing by Dr. Philip Garman.

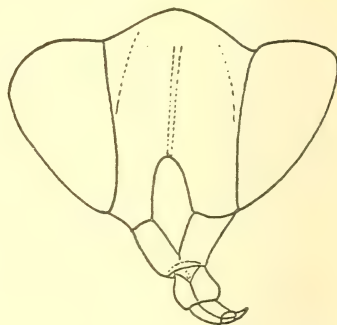


FIG. 40. *Lethocerus americanus* (Leidy),—front view of head, much enlarged. Drawing by Dr. Philip Garman.

B. *lutarium* (Stål). (Pl. xix, 4.)

Oft. Vet. Akad. Forh. xii, 190, 1855.

This species is about the same size as *flumineum* Say, but very easily told from it by the very prominent tylus and broad form. Nothing appears to be known of its habits.

North Guilford, 15 June, 1919 (M. P. Z.).

B. *flumineum* Say. (Pl. xvi, 6.)

Het. N. Harm., 38, 1832.

(*aurantiacum* Leidy. Jour. Acad. Nat. Sci. Phila. (2) i, 60, 1847.)

This is the commonest species of the genus, and by superficial characters other than those in the key, the moderately projecting tylus and proportionally narrower form separate it from *lutarium* as already noted, and its larger size from *testaceum*.

This species has the same general habits as the others, but its life history is known in detail. The adults hibernate buried in the

muddy pond bottoms, and in spring emerge to breed as soon as the ice is off the ponds and the water gets warm. The female by main force glues her eggs to the back of the reluctant and struggling male. After ten days or so, the eggs open by a lid and the young emerge. They molt five times and reach the adult stage in thirty-five to forty-two days from hatching. This gives a total period of development of forty-five to fifty-four days, so that three broods are a summer possibility.

New Haven, 24 Aug., 1913 (B. H. W.); New Canaan, 17 Sept., 1918 (B. H. W.); 30 Apr., 1919 (M. P. Z.); Hamden, 7 June, 1919, Cornwall, 12 Oct., 1919 (K. F. C.).

B. testaceum (Leidy).

Jour. Acad. Nat. Sci. Phila., Ser. 2, i, 60, 1847.
(*reticulata* Haldeman. Stansb. Exped., 370, 1852.)

This little species has been taken only occasionally in New York and New Jersey, but there seems to be no reason why it should not also be found in Connecticut. Its small size and blunt tylus distinguish it from its two larger cousins.

The little known about its habits indicates their similarity with those of the other members of the genus.

Family NEPIDAE.

By J. R. DE LA TORRE-BUENO.

This is perhaps one of the most curious and interesting families of the Heteroptera. The devices that adapt the species to a sub-aquatic life are among the most unique among insects. Like all waterbugs, they are transmogrified land bugs changed in certain particulars to enable them to cope with another element. So the Nepidae are provided with what looks like two tails, but is, in fact, a respiratory tube split lengthwise, through which air is taken direct from the atmosphere, while the bug stays a safe distance under water. These forms have also three pairs of peculiar openings in the abdomen, so-called false spiracles. No one seems to know their object, but it is suspected that they may be used in extracting oxygen direct from the water by osmosis. The anterior legs also are much modified, into scissors-like claws for seizing their victims, since they are predaceous in a high degree. The two American genera may be separated thus:

Key to Genera.

- Body flat, broad **Nepa**
- Body round, linear, narrow **Ranatra**

Nepa Linnaeus.

This genus has only one known American representative, which the generic key will serve to distinguish.

N. apiculata Uhler. (Pl. xvi, 1.) (Fig. 41.)

Proc. Bost. Soc. Nat. Hist. xix, 440, 1878.

Very little seems to be known about this species, beyond the fact that its favorite haunts are grassy, shallow, slow-moving streams, where it clings to the vegetation; and that at times it is found under stones in shallow places. The eggs, like everything about the family, are notable; they have seven short raylike filaments at the top. They are laid in the soft tissue of plants and only the crown of the filaments projects. Other habits are not known.

This has been recorded from Ontario, Canada, south to the District of Columbia and west to Ohio and Illinois.

New Haven, 11 Aug., 1908 (B. H. W.).

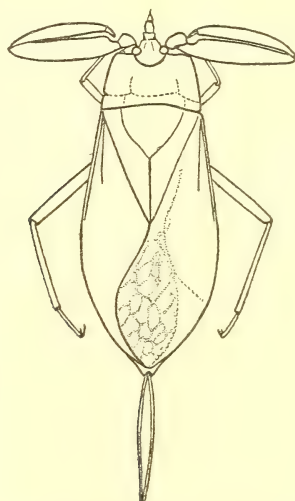


FIG. 41. *Nepa apiculata* Uhler,—dorsal view, greatly enlarged. Drawing by Dr. Philip Garman.

Ranatra Fabricius.

This genus is most marked in aspect. Unlike *Nepa*, it frequents deeper waters and may commonly be secured in ponds, hanging head down from grasses growing up out of the water. Its long, narrow shape gives it the look of a little brown twig, enhanced by the manner in which it stiffens and plays 'possum when taken from its element. It has a chirp produced by jerking its front legs, which, scraping against the thin wall of the anterior insertion, give forth a shrill sound. All the species are carnivorous. They prey on other insects and are said to feed on fish eggs as well. The three Eastern species may be thus separated:

Key to Species.

1. Anterior femora unidentate 2
 Anterior femora with a second tooth-like prominence near the joint
 of the tibiae *americana*
 2. Anterior femora narrow, elongate; legs thin, elongate *protensa*
 Anterior femora wide, short; legs stout, short *kirkaldyi*
- R. americana** Montandon (*quadridentata* Uhler. Heidemann,
 Bueno et Auctt. Am., nec Stål). (Fig. 42.)
 Bull. Soc. Sci. Buc., xix, 65, 1910.

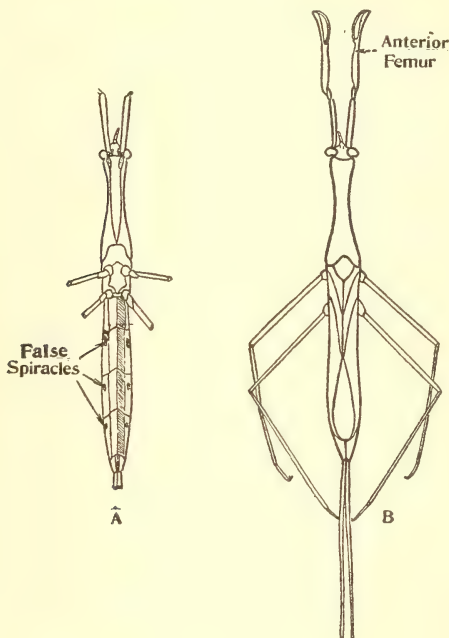


FIG. 42. *Ranatra americana* Montandon,—(a) ventral view of body, (b) dorsal view, natural size. Drawing by Dr. Philip Garman.

This is the largest and most common Eastern representative of the genus. It is found in all collections and may be taken in any suitable pond. It hibernates as an adult, buried in the mud of the pond-bottom, or hiding under some overhanging bank or perhaps frozen in the ice. In the spring, sometimes as early as March, it deposits its eggs, sinking them into the soft tissue of decaying stems of rushes or in some water-soaked and softened piece of wood, with the two filaments sticking out. When they are thick, the outstanding filaments look like a white fuzz on the surface. Ordinarily, however, they are laid in a straight line. They hatch

out in about thirty days and after moulting five times, reach the adult stage in about forty-six days, or say seventy-five days for all the transformation. There seems to be only one brood in a summer, however, as the eggs are deposited some time in May, and the females continue ovipositing into June.

It is commonly distributed all over the United States except the extreme West and South.

West Thompson, 12 July, 1905 (H. L. V.); Ansonia, Aug., 1915 (B. H. W.).

R. protensa Montandon. (*fusca* Bueno.)

Bull. Soc. Sci. Buc., xviii, 185, 1910.

This is a somewhat rare species in the East, but it has been taken in New York and should doubtless occur in Connecticut. Beyond the differential character mentioned in the key, it may be stated that in general it is more slender in build than *americana*, with shorter legs, breathing tube, etc. No details of habits or life history of this species are known.

R. kirkaldyi Bueno.

Can. Ent., xxvii, 187, 1905.

This small species is readily separable from the other two larger species, in addition to the characters of the key, by the much constricted prothorax and much smaller size. Nothing is known of its life history.

It should be remembered that in this genus the female is both larger and stouter than the male, with larger eyes and a sharp ovipositor. Before this was known, species had been founded on this difference in size of the eyes.

This well-marked little species was first discovered in Putnam County, New York, and has subsequently been found in New Jersey.

Family NAUCORIDAE.

By J. R. DE LA TORRE-BUENO.

This family, so important and extensive in the Old World and so numerous in individuals and species in tropical America, is represented in the Atlantic States by only one genus. The group is nearly related to the Belostomatids; in fact certain Oriental representatives of both are very near in general aspect, and are separable largely by technical characters.

Pelocoris Stål.

This genus has only one species.

P. femoratus Palisot de Beauvois. (Pl. xvi, 3.) (Fig. 43.)

Ins. Rec. Afr. Am., 237, pl. 20 f. 4, 1805.

This is at times abundant in ponds with fine vegetation growing from the bottom, among which it hides, lying in wait for

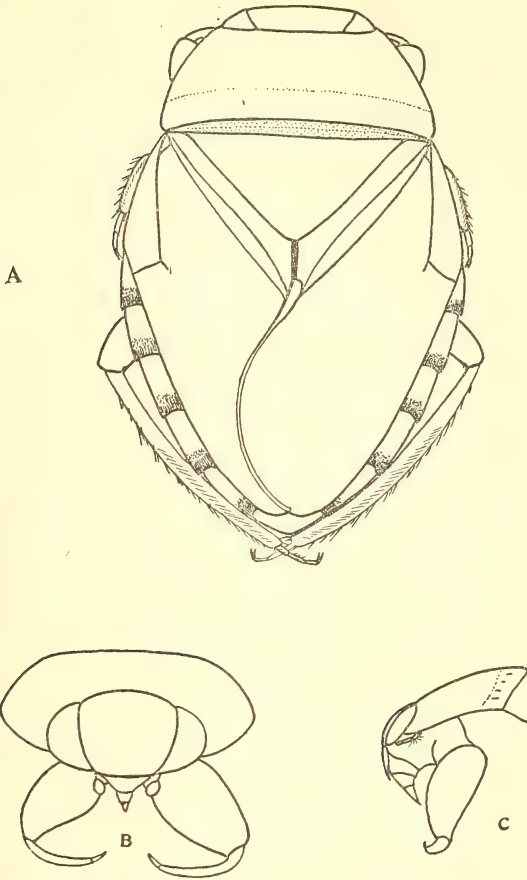


FIG. 43. *Pelocoris femoratus* Palisot de Beauvois,—(a) dorsal view, (b) front view of head, (c) lateral view of head; all greatly enlarged. Drawing by Dr. Philip Garman.

the victims of its voracity. Here, too, it breeds and fastens its glistening white ova on the stems or leaves of *Myriophyllum* and other fine-leaved aquatic plants. In from twenty-two to twenty-seven days the little bug hatches from this egg and after moulting five times in eighty-seven days, he is full grown and equipped for the serious business of life. Although, owing to oviposition being continuous, nymphs in several stages may be taken together, there is no positive evidence that there is more than one, or at most two broods in the course of a summer. The species is reported to range from Canada to South America. As most of the descrip-

tions are for color characters, it is possible there are several species confounded.

Cheshire, 6 May, 1911 (B. H. W.); New Canaan, 5 Sept., 1916 (M. P. Z.).

Family NOTONECTIDAE.

By J. R. DE LA TORRE-BUENO.

These are the well-known back-swimmers, also called sometimes boat-flies. All are aquatic and some species or other is sure to be found in ponds or backwaters of slow streams, in the vegetation close to the shore. Their chief peculiarity is that they swim upside down, or upon their backs, mostly at or near the surface of the water. The third pair of feet is thickly fringed with long hair and used in swimming, except in *Plea*. All are carnivorous, feeding on other insects, on young fish and on Entomostraca. They are reported to be very troublesome in fish hatchery tanks. The life history of three of our American forms is known. The several groups of the family may be thus separated:

Key to Subfamilies.

- | | |
|---|----------------------|
| Hind tibiae and tarsi ciliated, abdomen keeled, hairy, eyes very large, conspicuous | NOTONECTINAE, p. 404 |
| Hind tibiae and tarsi apparently not ciliated, abdomen neither keeled nor hairy, eyes small | PLEINAE, p. 407 |

Subfamily NOTONECTINAE.

The subfamily *Notonectinae* is the most important, as it contains by far the greatest number of species and most of the genera. Of the latter there are only two in the Eastern United States, *Notonecta* and *Buenoa*, which may be distinguished thus:

Key to Genera.

- | | |
|---|---------------------------|
| Hemelytra pilose, hind tarsi without claws, last antennal joint much shorter than preceding joint | <i>Notonecta</i> , p. 404 |
| Hemelytra glabrous, hyaline, hind tarsi clawed, last segment of antennae much longer than preceding joint | <i>Buenoa</i> , p. 407 |

Notonecta Linnaeus.

Key to Species.

- | | |
|--|-------------------|
| 1. Pure white, entirely black, or black and white | 2 |
| Colored species, more or less marked with black | 4 |
| 2. Distance between eyes at front, not more than three times their distance at vertex; pronotum about twice as wide as long | 3 |
| Distance between eyes at front, six times their distance at vertex; pronotum one and one-half times as wide as long, size 8-9 mm. | <i>raleighi</i> |
| 3. Distance between eyes at front about twice their distance at vertex; subrobust, size 10-13 mm. | <i>undulata</i> |
| Distance between eyes at front about three times their distance at vertex; slender, white, often with faint black markings; size 8-10 mm. | <i>variabilis</i> |

4. Distance between eyes at front, not more than three times their distance at vertex; pronotum twice as wide as long 5
Distance between eyes at front, six to eight times their distance at vertex; slender; scarlet and black; size 10-12 mm. *uhleri*
5. Distance between eyes at front, three times their distance at vertex; irrorated black and brown, variable; size, 12-14.5 mm. *irrorata*
Distance between eyes at front nearly equal to their distance at vertex; fuscous, greenish-white, or testaceous with more or less black; size, 12.6-15.5 mm. *insulata*

N. undulata Say.

Heter. N. Harm., 39, 1832; Compl. Writ., i, 368, 1859.

This is by far the most widely spread species in America, and ranges from British Columbia to Chile. Small white specimens may sometimes be confused with *variabilis* or *raleighi*, but the latter are easily recognized by the head structure and their greater slimness. The species varies in color from pure white to black. Its color variations have given rise to a lengthy synonymy not mentioned. According to Hungerford, this species has five stages of nymphal development, which take about forty days from the egg to the mature insect.

Southington, 21 May, Hamden, 24 Oct., 1910 (B. H. W.); Cromwell, 9 Apr., 1919 (M. P. Z.); Kent, 10 Aug., 1918 (M. P. Z.); New Canaan, 17 Sept., 1918 (B. H. W.).

N. variabilis Fieber. (Pl. xvi, 5.)

Abh. Böhm. Ges.-Wiss. (5) vii, 477, 1851.

(*undulata* Uhler. Stand. Nat. Hist. Vol. ii, 252, 1885 (in part); *americana* Ashmead. Ins. N. J., 144, 1899.)

This small species is readily separated from *N. undulata* on the characters given in the table. Nothing is known about its life history except the egg and the embryonal period.

New Haven, 16 May, 1904 (W. E. B.); 22 Aug., 1904 (P. L. B.); Hartford, 13 Aug., 1904 (H. L. V.); Hamden, 24 Oct., 1910 (B. H. W.), 18 May, 1919 (M. P. Z.); Colebrook, 19 June (P. G.); Guilford, 13 July, 1920 (P. G.).

N. raleighi Bueno.

Can. Ent., Vol. xxxix, 225, 1907.

(*variabilis* (Fieber), Bueno, in part, in various papers prior to this date).

This species very much resembles a dwarf *variabilis* but is easily distinguishable by the structure of the head. So far it is known from New Jersey south, but it should be found in Connecticut.

N. uhleri Kirkaldy.

Ann. Mag. Nat. Hist. (6) xx, 58, 1897.

Its bright scarlet and black color make this the most striking of our local species. The head also is so distinctive that there is no danger that it may be confused with any other. It is rather rare, although on the occasions it has been taken it was comparatively abundant.

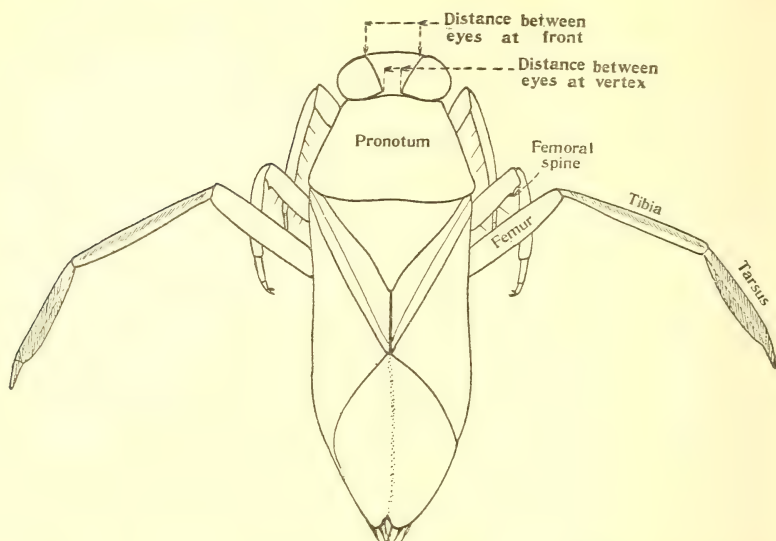


FIG. 44. *Notonecta irrorata* Uhler,—dorsal view showing structures, greatly enlarged. Drawing by Dr. Philip Garman.

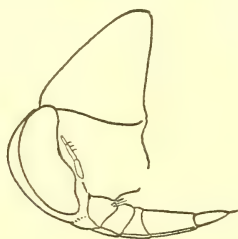


FIG. 45. *Notonecta irrorata* Uhler,—lateral view of head, much enlarged. Drawing by Dr. Philip Garman.

***N. irrorata* Uhler. (Pl. xvi, 7.) (Figs. 44, 45.)**

Proc. Bost. Soc. Nat. Hist. xix, 443, 1878.

This handsome bug is quite abundant and widespread, ranging from Canada to Maryland. Its black coat spangled with brown is very distinctive and this in connection with its size and heavy build separates it from the other Connecticut species. This has also been bred by Hungerford, who finds it has the usual five nymphal instars. The developmental period is about sixty days. Egg laying begins in May.

Branford, 3 Aug., 1904 (H. L. V.); Windsor, 26 July, 1905 (W. E. B.); New Haven, 24 Nov., 1910 (A. B. C.); Hamden, 24 Apr., 1911 (B. H. W.).
N. insulata Kirby. (Pl. xvi, 8.)

Richardson's Faun. Bor. Am., iv, 285, 1837.

It has had other names, but they are of technical interest only. Its color variability is great, and five varieties have been named. It is the largest of our native species and has a fondness for cold waters.

Milford, 21 Mar., New Canaan, 3 Apr., 1919 (M. P. Z.).

Buenoa Kirkaldy.

(*Anisops*, in part, for American species.)

Key to Species.

1. Small species, less than 6 mm. long 2
 Larger, more than 6 mm. long *margaritacea*
2. Eyes large and prominent; shape slender *elegans*
 Eyes large but not prominent; shape more convex *platycnemis*

B. margaritacea Bueno.

Jour. N. Y. Ent. Soc. xvi, 238, 1908.

(*platycnemis* Uhler, Stand. Nat. Hist. ii, 250, 1882; Bueno, Jour. N. Y. Ent. Soc. x, 236, 1902.)

This species is abundant all over the Eastern United States, and frequents cold pools. Its food seems to be largely Entomostraca, although occasionally it eats small insects. The anterior legs are furnished with long spines, within which, as in a cage, *Buenoa* holds its prey. In this, as in other waterbugs, there are five nymphal stages, which give a life history from oviposition to adult of some five or six weeks.

B. platycnemis (Fieber).

Abh. Böhm. Ges. Wiss. (5) vii, 485, 1852.

A species known from New York and New Jersey, but not thus far recorded from Connecticut, many records under this name belonging to *margaritacea*.

B. elegans (Fieber).

Abh. Böhm. Ges. Wiss. (5) vii, 484, 1852.

Known from New York where it is commonly taken along the edges of ponds among grasses in clear places.

Subfamily PLEINAE.

This subfamily is represented in the East by only one species, which is common in *Myriophyllum*, among which it creeps. Another has recently been described from Mississippi, and as so little is known about this genus, it is included here.

Plea Leach.

Key to Species.

1. Elytral sutures faint or absent; color markings inconspicuous; head with a light median streak; elytra strongly arched posteriorly **striola**
- Elytral sutures strongly marked; color markings conspicuous; head with a large triangular dark spot between the eyes; elytra moderately arched posteriorly **harnedi**

P. striola Fieber.

Abh. Böhm. Ges. Wiss. (5) iii, 296, pl. 2, figs. 1-3, 1845.

This species is carnivorous, feeding mainly on Entomostraca. The eggs are inserted into the soft tissue of the vascular water plants.

Milford, 26 Aug., 1905 (H. L. V.).

P. harnedi Drake.

Ohio Jour. Sci., xxii, 114, 1922.

Described from Mississippi.

Family SALDIDAE.

(Acanthiidae.)

By J. R. DE LA TORRE-BUENO.

The family Saldidae, also known as Acanthiidae, according to one's nomenclatorial views, is the link joining the land bugs to the subaquatic Cryptocerate Hemiptera. It introduces the series and leads through the Ochteridae to the Naucoridae, Belostomatidae and finally Corixidae and Notonectidae.

The species of this family in this country ordinarily frequent damp and marshy spots or the shores of waters where there is abundant moisture, some living on the sea beaches and tidal flats. In Europe, one species lives on dry heaths; and an arboreal form is found in Hawaii. They are exceedingly agile and it is quite an art to catch them. Where they are thick, it is possible to get them into a sweeping or butterfly net brushed close to the ground.

So far as known, all Saldids are predaceous. As to a complete life history, this is as yet unknown, although Prof. H. B. Hungerford has observed the mating, oviposition and one or two nymphal stages of *Lampracanthia anthracina* and *L. crassicornis*. Further than this, nothing seems to be known about any species.

The latest, and in fact, the only complete taxonomic study of the family is by Dr. O. M. Reuter, who in 1912, split up the old and comprehensive genus *Salda* (or *Acanthia*) into a number of genera, separable by the following table. All the genera are included in it, since so little is known about the family in this country that it would not be surprising to find heretofore unrecorded foreign genera here, just as there are four Palaearctic species of *Saldula* found with us.

It should be noted that the generic arrangement is according to Reuter, and the species, as well as nomenclature follow Van Duzee, to agree with his Catalogue and facilitate reference. Where species are placed in genera other than those to which they are assigned by the latter author, it is because careful checking up of descriptions and specimens has shown unequivocally that they belong where they are now placed. All of our species belong in the subfamily Saldinae.

Key to Genera.

1. Ocelli more distant from the eyes than from each other, or contiguous. Scutellum longer than wide. 2
 Ocelli at equal distances from each other and from the eyes. Scutellum subtransverse[*Orthophrys*]
2. Membrane with four entire areoles; or with five areoles, of which the subexternal or 4th is shorter than the others, leaving the 3d and 5th contiguous for a greater or less distance apically 3
 Membrane with five complete areoles*Pentacora*, p. 410
3. Sides of pronotum more or less explanate; anterior pronotal callus never reaching its lateral margins 4
 Sides of pronotum scarcely explanate; anterior callus occupying all or nearly all the width of the pronotum 11
4. Apex of pronotum nearly as wide as the head, which is slightly wider; hemelytra thickly, and usually distinctly, punctulate; or subcoriaceous 5
 Apex of pronotum narrower than the head; or if nearly as wide, hemelytra impunctate 6
5. Membrane usually with five areoles, of which the subexternal (4th) is shorter than the neighboring third and fifth; last female ventral segment truncate[*Chiloxanthus*]
 Membrane with four complete areoles of nearly equal length; last female ventral segment roundedly produced[*Halosalda*]
6. Apex of pronotum nearly as wide as head with the eyes, callus moderately convex, sulcus behind the callus without impressed points and transverse rugulae 7
 Apex of pronotum distinctly narrower than the head taken with the eyes, callus strongly convex, anterior and posterior limiting sulci deep, furnished with impressed points and longitudinal rugulae. (Hemelytra opaque, only the costal area of the corium and embolium shining)[*Ioscytus*]
7. Antennae slender; third joint of posterior tarsi equal to or but slightly shorter than second 8
 Antennae stout; third joint of posterior tarsi distinctly shorter than second[*Calacanthia*]
8. First or inner areole of membrane produced but little more than one-third of its own length above the base of the second 9
 First or inner areole of membrane produced two-fifths or one-third above the base of the second. (Hemelytra often punctate, always without sericeous spots. Embolium entirely black)
Salda, p. 412
9. Corium with one distinct vein, the interior vein often obliterated toward the apex. Apex of the first, or interior, areole placed distinctly above the apex of the second, very rarely reaching it, in which case the corial veins are obsolete 10
 Corium with two perfectly distinct veins, the inner furcate toward the apex, the branches reaching the membranal suture. Apex of the first or interior areole of the membrane reaching or nearly reaching the apex of the second*Saldula*, p. 412

10. Hemelytra entirely or nearly entirely opaque or sericeous-opaque; both veins of corium obsolete; embolium discolored; interior areole reaching apex of membrane *Micracanthia*, p. 415
 Hemelytra greasy-shining, with sericeous black spots; corium with exterior vein distinct and the interior ones also distinct at base; interior areole set distinctly above apex of the second areole [Teloleuca]
11. Pronotum (brachypterous form) with posterior sulcus to callus placed far behind the middle; entire hemelytra very shining, in the brachypterous form entirely coriaceous; convex, membrane scarcely differentiated. Ocelli scarcely separated from each other *Lampracanthia*, p. 415
 Pronotum (in brachypterous forms also) with the posterior sulcus to callus placed slightly or but little behind the middle (apical stricture not included). Hemelytra flat, sericeous-opaque, embolium polished, white-marked. Ocelli contiguous, set in a distinct elevation [Chartoscirta]

Pentacora Reuter.

This genus corresponds with the division Uhler made in his 1877 monograph of the family to contain the species having five areoles or cells in the wing membrane, and in connection with other less obvious characters sufficiently fixes the family. The cells are elongate, fairly narrow, and complete. At times there is a cross vein dividing the long cell into two parts, more or less unequal, but this is not even a specific character, being found only in a specimen here and there. The species of the genus seem to be found on saline beaches by preference. The table following separates our five species. While there seem to be no Connecticut records of some of them, this must be because of absence of collecting rather than from lack of the species. All are found on the Sound shores of Long Island and New York on the mainland.

Nothing seems to be known of their life histories.

Key to Species.

1. Species glabrous, polished, covered on the upper part of the body with long erect dark hairs 2
 Species with upper part dull, pubescent, with or without dark, erect or recumbent hairs 3
2. Antennal joint four much longer than one *hirta*
 Antennal joint four slightly longer than one *pellita*
3. Margins of the prothorax and corium without spines 4
 Margins of the prothorax and corium with a single row of short, stout spine-like bristles *signoretii*
4. Prothorax four times as wide as long; explanate margin narrowly luteous with a black reflexed edge; hemelytra with short, erect hairs *ligata*
 Prothorax three times as wide as long; margins concolorous, with a wider black reflexed edge; hemelytra with very short recumbent, almost bristle-like hairs *sphacelata*

P. signoretii (Guérin).

In Sagra, Hist. Cuba, Ins., 401, pl. 13, fig. 10, 1857.

ornata Stål, Stett. Ent. Zeit., xxiii, 458, 1862.

This species is not recorded from the State. As it has been taken at Sea Cliff, Long Island, across the Sound, and as the species is perhaps the most widespread of the genus, there seems to be no real reason why a little careful collecting on sandy beaches should not bring it to light.

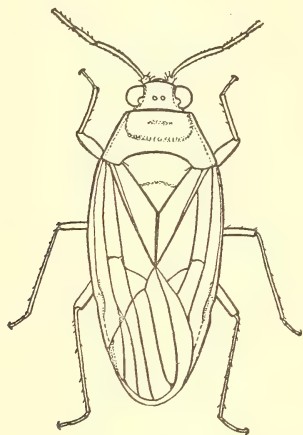


FIG. 46. *Pentacora ligata* Say,—dorsal view, greatly enlarged. Drawing by Dr. Philip Garman.

P. ligata (Say). (Fig. 46.)

Het. New Harm., 34, 1832.

This seems to be a more common species and of wider range of habitat than the preceding. Perhaps a quotation from Uhler's writings will help to visualize the species. He terms it "a sprightly species, which inhabits dark rocks in the beds of running streams and brooks in the metamorphic region of Maryland, and of Eastern Massachusetts . . . from May 'till October." So far, it does not appear to have been recorded from Connecticut.

P. hirta (Say).

Het. New Harm., 34, 1832.

Pentacora hirta seems to be one of the most abundant species of the genus in the East. It is commonly to be found on the muddy tidal flats and beaches of the Sound, hunting around among the sedges in company with *Saldula interstitialis* and *Pentacora sphacelata*.

New Haven, 28 June, 1916 (W. E. B.); Madison, 12 July, 1916, Guilford, 26 June, 1918 (B. H. W.).

P. pellita (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii; 433 (*Salda*), 1877.

Van Duzee lists this species under his genus *Saldula* although it has according to the description, five areoles in the membrane. Few specimens so determined have come into our hands, and none of them from Connecticut. It may prove to be a form of *hirta*.

***P. sphacelata* (Uhler).**

Bull. U. S. Geol. Geog. Surv. Terr., iii, 434, 1877.

This species likewise will be found under *Saldula*. It may not be out of place to here remark in passing that Reuter's work cited previously has left many of our American species in the air, so that short of a thoroughgoing revision of the family, it is impossible to place them accurately. This, however, is done so far as possible in this writing.

P. sphacelata is another very common form on sea beaches from Massachusetts to Florida.

Madison, 12 July, 1916 (B. H. W.).

***Salda* Fabricius.**

***Sciodopterus* Amyot and Serville.**

The only American representative of this genus is

***S. littoralis* Linnaeus.**

Syst. Nat., Edn. 10, 442, 1758.

The complete synonymy is largely of historic interest. It may be found in Van Duzee's Catalogue in extenso. This is the one we can be certain of; the other two species mentioned in Van Duzee will be found in *Lampracanthia*, to which, in fact, Reuter refers *anthracina* Uhler. *S. littoralis* is widespread throughout Europe, and has been recorded from various parts of the United States. The given distribution is such that it should in time be recorded from Connecticut.

***Saldula* Van Duzee.**

(*Acanthia* Fabricius.)

The generic synonymy is omitted here, and the Vanduzeean name adopted for the sake of conformity. There are in the Eastern United States ten species of the genus, of which four are Palaearctic also; in the whole country we have seventeen, the others being Western. By far the most common of these are *S. pallipes* Fabricius, and *S. interstitialis* Say, followed by the black *S. major* Provancher. Our Eastern species, and therefore, the Connecticut forms, will be easily separated by the following table.

Key to Species.

- | | |
|---|--------------------|
| 1. Margin of pronotum concolorous black, body with or without erect hairs | 2 |
| Margin of pronotum yellowish, body not covered with erect hairs | |
| | xanthochila |

2. Sides of pronotum curved 3
Sides of pronotum straight 8
3. Corial margin white or yellowish marked or spotted 4
Corial margin concolorous black; large nearly unspotted dark species **major**
4. With long erect hairs on upper part of body 5
Without such hairs 6
5. Large shining species, corial margin with two long flavous spots, sometimes confluent; form elongate **confluenta**
Small dull species, covered with a golden pubescence; entire corial margin except base narrowly dull flavous; one white spot of variable size at apex of corium and five or six bluish spots on the corium; form orbiculate **orbiculata**
6. Corial margin marked with white or flavous 7
Corial margin unspotted or concolorous **interstitialis**
7. One long white or flavous mark at the middle of the corial margin and a small flavous spot before the apex. (Corial spots small, obscure and not joined to the marginal ones.) **saltatoria**
Corium with large whitish spots, broadly joined to the marginal ones (Hemelytra mostly pale with ill-defined nebulous brownish spots; tibiae pale) **pallipes**
8. Upper part of body without long erect hairs, corium more or less pale-spotted, with large pale areas at margin 9
Upper part of body with long erect hairs; corium all black except a small marginal white spot close to the apex **separata**
9. Margin of hemelytra entirely flavous, except the extreme base, forming a regular flavous band margined at each side by a brownish longitudinal nervure **opacula**
Margin of hemelytra with two long flavous spots and one minute pure white spot apically **reperta**

S. major (Provancher).

Nat. Can., 107, 1872.

Salda deplanata Uhler, Bull. U. S. Geol. Geog. Surv. Terr., iii, 442, 1877.*Salda lugubris* Uhler (not Say), *ibid.*, i, 333, 1876.

Saldula major has figured in all collections up to a very recent period as *deplanata* Uhler. It is a large black dull form frequently found on the shores of ponds or other places where there is black mud. It is not very abundant but being rather slow to move, it is not difficult to catch with the fingers. Widely as it is spread, it has not been recorded from Connecticut, although it is found in the neighboring states. The nymphs are shining black and quite as large as the adult smaller members of the genus.

S. confluenta (Say).

Het. New Harm., 35, 1832.

This is a shining species in bright black and white pattern found about ponds. While not rare, it is not often seen in collections.

Cornwall, 5 July, 1919 (M. P. Z.); So. Meriden, 11 July, 1914 (H. L. J.).

S. orbiculata (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii, 450, 1877.

This pretty little species is not yet recognized from Connecticut.

S. interstitialis (Say).

Jour. Acad. Nat. Sci. Phila., iv, 324, 1825.

This is an extremely melanic and variable form, which may be distinguished without difficulty by the key. It may turn out to be nothing but a dark variety of *S. pallipes* Fabricius. It is by far the commonest species in the Eastern States, together with *pallipes*, with which it is found. It ranges from Maine to Florida and from Massachusetts to California. The one Connecticut record, which is new, are two specimens taken by Mr. H. L. Viereck, and determined by Mr. Van Duzee as *pallipes* Fabricius.

Stratford, 16 Aug., 1904 (H. L. V.).

S. separata (Uhler).

Proc. Bost. Soc. Nat. Hist., xix, 432, 1878.

So far this species has been recorded only from Massachusetts, New Hampshire and Pennsylvania.

S. reperta (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii, 447, 1877.

Says Uhler of this species, "This is a robust little species, very closely related to *S. interstitialis* Say, . . . But the different shape of the pronotum, with the other details, will at present serve to separate it."

Hamden, 28 Apr., 1921 (B. H. W.); Milford, 2 May, 1921 (B. H. W.); New Haven, 26 March, 1921 (B. H. W.); East Haven, 10 May, 1921 (M. P. Z.).

S. xanthochila (Fieber).

Wien. Ent. Monat., iii, 234, 1859.

Xanthochila is a Palaearctic species, which with us ranges to Colorado and California.

Branford, 11 Aug., 1904 (H. L. V.).

S. pallipes (Fabricius).

Ent. Syst., iv, 71, 1794.

This is a common and highly variable species, and readers are referred to Van Duzee's Catalogue for the full synonymy.

Not alone is it abundant and widespread, ranging as it does all over Europe, and so far as known, the greater part of the United States, but also it is highly variable in markings. Our Eastern specimens, so far as known to me, belong to the variety *dimidiata* Curtis, in which the hemelytra are nearly all white, save for a broad black band at the base. And strange to say, common as it is, it has been recorded from only nine States. The Connecticut record given here makes this the tenth State.

Almost any collection of Saldidae made on the shores of stream or pond, or among the sedges of the salt marshes, will number hosts of this common little species. Nothing is known of its life history, as is true of the other species of the genus.

East Hartford, 18 Aug., 1906 (B. H. W.).

S. opacula (Zetterstedt).

Ins. Lapp., col. 268, 1840.

Here we have a pretty and very distinct little form. Although Mr. Van Duzee, in his catalogue, notes that it may not be different from *sphacelata*, it is distinguishable from this species not only by not having five membranal areoles, but also by its smaller size, and distinct color pattern, the striking characteristic of which is the narrow regular flavous margin of the corium. The species is Palearctic, and thus far seems to have been recorded only from Massachusetts. It has been taken here and there in ones and twos in other Eastern States, and we shall doubtless, before long, see it recorded from Connecticut, particularly since it has been taken on the North shore of Long Island.

S. saltatoria (Linnaeus).

Syst. Nat. Edn. 10, i, 448, 1758.

This is one of the common European species. It has heretofore been recorded only from New York and Illinois.

Lyme, 30 Apr., 1911 (A. B. C.).

Micracanthia Reuter.

This genus was established by Reuter to contain two American species, the Eastern *Salda humilis* and the Western *pusilla*.

M. humilis (Say).

Het. New Harm., 35, 1832.

This is a very pretty tiny species, the smallest American representative of the family. It is quite common and very active and lively. Its range is from Maine to Florida and from Massachusetts to California. Strange to say, it has only recently been recorded from Connecticut.

Orange, 22 June, 1920 (M. P. Z.).

Lampracanthia Reuter.

This genus is well characterized in the key. Its species may at once be distinguished by their shining black color and the membrane scarcely separable from the corium as to texture. Three species are given in the following table, although but two should be found in Connecticut, if we are guided by the published records. The species are commonly found in bogs, roaming about at the roots of the sedges and grasses. Reference has already been made to their oviposition. The table following will serve to separate the species, so far as one may judge by descriptions.

Key to Species.

1. Callus long, slightly or moderately convex; hemelytra moderately expanded at base, not much wider than pronotum 2
- Callus very short, strongly convex; hemelytra broadly expanded at base, much wider than the pronotum **coriacea**
2. Callus very long, with two foveoles; posterior lobe of pronotum a very narrow, slightly elevated, linear tablet; first joint of antennae short and stout; length 4.75 mm. **crassicornis**

Callus slightly convex, moderately long, with one foveole; posterior lobe short; first joint of antennae long and not much thicker than three; length 4-6 mm. **anthracina**

L. crassicornis (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii, 438, 1877.

This species is given by Van Duzee as occurring in New Hampshire. It was originally described from the Saskatchewan River, in the Canadian Northwest, and Hungerford records it from New York. It may, or may not, be found in Connecticut, eventually.

L. anthracina Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., iii, 438, 1877.

Our common shining black Saldid, to which I suspect all Eastern records for the preceding and following refer, if, indeed, it should not eventually turn out that *coriacea* following is only a dimorph of this brachypterous species. So far, it is unreported from Connecticut.

L. coriacea Uhler.

Rept. U. S. Geog. Surv., 421, 1871.

The remarks preceding cover this species, reported thus far from all the States bordering on Connecticut. The two last species are placed by Van Duzee in the genus *Salda*.

Orange, 4 June, 1910 (B. H. W.).

In conclusion, it cannot be too much emphasized that if there are few Connecticut records of this interesting group, it is merely because they have not been collected. In one summer, any industrious collector should be able to get at least eight or ten of the species mentioned in goodly numbers, even though he work in a restricted locality.

It may also not be amiss to remark that the genera *Chiloxanthus* Reuter and *Chartoscirta* Stål, are both found in America, and careful collecting may turn them up in the East; the same is equally true of the other genera, for there are few insects so widespread as the genera and species of water bugs and their allied littoral forms.

Family VELIIDAE.

By J. R. DE LA TORRE-BUENO.

The family Veliidae contains three genera which may be separated as follows:

Key to Genera.

1. Anterior tarsi, each with more than one joint 2
Anterior tarsi one-jointed; intermediate tarsi longer than posterior, third joint split, with feathery hairs in cleft
Rhagovelia, p. 417
2. Anterior tarsi two-jointed; last antennal joint longest
Microvelia, p. 419
Anterior tarsi three-jointed; intermediate tarsi longer than posterior; feathery hairs and cleft wanting; first antennal joint longest **Velia**, p. 417

Velia Latreille.

The genus *Velia* is represented in the Atlantic States by only two species, neither of which is known as yet from further north than the vicinity of Washington, D. C. Aside from the fact that they are semi-aquatic, little seems to be known in regard to these insects. Miall limits his remarks on the European *Velia currens* to stating that it swims under water more readily than *Gerris* and walks back downward on the surface film. The genus is dimorphic as to wings which of course makes certain structural changes in the thorax. Like all their congeners, the species of the genus are predaceous.* So far as known, they are stream forms, as denoted by the names of the two Europeans, *currens* and *rivulorum*. These two congregate in small schools, but this can scarcely be the habit of our own forms, as they have been taken only by ones and twos. The European species overwinter as adults in moss on stones. The eggs are deposited in spring on the vegetation coming to the surface.†

The species thus far recognized from the Eastern United States may be separated as follows:

Key to Species.

- Intermediate tarsi subequal to, or but little longer than posterior,
second and third joints subequal; second joint of hind tarsi longer
than third **stagnalis**
Intermediate tarsi much longer than posterior, second joint much
longer than third; second joint of hind tarsi shorter than third;
(first joint of antennae nearly one and a half times as long as
second) **australis**

V. australis Bueno.

Bull. Brook. Ent. Soc., xi, 54, 1916.

V. stagnalis Burmeister.

Handbuch d'Ent., ii, 212, 1835.

Rhagovelia Mayr.

Rhagovelia, next to *Rheumatobates*, is perhaps the most interesting genus of the waterstriders in regard to very special adaptation to a peculiar habitat. In nature, I know two species, our own North American *Rhagovelia obesa*, and a *Rhagovelia* from Mexico, both of which are found only in running streams. The unique cleft intermediate tarsus and the swimming plume arising therefrom are peculiarly suited to the insect's constant striving against strong currents. The species of this genus are dimorphic, but in our latitude the fully winged forms are rarely seen. Little is known as to their breeding habits or other phases of life. The

* A. Griffini, Gli Insetti Acquaioli. 1894.

† C. Wesenberg-Lund, Fortpflanzungsverhältnisse: Paarung und Eiablage der Süsswasserinsekten. Forts Nat. Forsch. Halle vii, 196, 6.

forms occurring in the United States are easily separated, aside from the difference in habitat, as follows:

Key to Species.

1. Second and third joints of middle tarsi equal; female with knobbed posterior pronotal process; posterior femora incrassate in male only **oriander**
- Second and third joints of middle tarsi unequal; female without pronotal process; posterior femora equally thick in both sexes .. 2
2. Third joint of posterior tarsi longer than second; hind femora incrassate and spinose in both sexes; very dark in color with a more or less aeneous lustre **obesa**
- Second joint of posterior tarsi longer than third; hind femora scarcely incrassate in both sexes, not spinose; lead gray in color (subgenus *Trochopus* Carpenter) **plumbea**

R. obesa Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 107, 1871.

This species, according to Uhler in the Standard Natural History, is found throughout the Atlantic States in the rapid parts of streams. In such places, the individuals congregate in schools, swimming powerfully in zigzags against the current, or at times sheltered behind some projecting rock, placidly paddling in the eddies that swirl about it. The peculiar tarsal plume in this species and its striking function are described in detail in the Canadian Entomologist.* This is a difficult form to confine in an aquarium as it immediately takes to diving and finally perishes. *Rhagovelia obesa* is sometimes found winged about New York, but so rarely that twenty years of collecting have yielded only seven specimens. So far, it has been recorded from the Atlantic States north of Georgia. It is perhaps the most widespread species of the genus and it has been suspected that some of Champion's Central American species may be but unrecognized variants of it. Central America seems to be the metropolis of the genus, since most of the known species occur there.

R. oriander Parshley.

So. Dak. State Coll. Technical Bull. No. 2, 19, ff. 2, 19, 1922.

This species, although described from South Dakota, is inserted here because our knowledge of these forms is so incomplete that it or another species may be found in Connecticut.

R. (Trochopus) plumbea Uhler.

Proc. Zool. Soc. London, 217, 1894.

This species is a denizen of estuaries and bays and other brackish and salt waters on our coasts. There is only one other species of the genus with a like habitat, *R. salina* Champ., which is found on the Central American coast. Nothing further seems to be known of its habits, but perhaps some Floridian traveler

* On *Rhagovelia obesa* Uhler, Vol. xxxix, 61, 64, 1907.

may some day make a very fascinating study of its life history. Its leaden hue alone is enough to distinguish it from its near relatives, aside from the differences noted in the key, its long, slim legs, its short body, and the other characters indicated by its authors.

Microvelia Westwood.

Ann. Soc. Ent. Fr., iii, 647, 1834. *Hydroëssa* Burmeister, Handbuch, ii, 213, 1835. *Veliomorpha* Carlini, Ann. Mus. Genova, xxxv, 120, 1895.

This genus contains not only the smallest of the water-striders, but also of all the water-dwellers among the Hemiptera except *Helotrephes* in the Notonectidae. It is probably the most abundant as to numbers and species, and the most widely distributed, since it is known from all the continents and nearly all the islands, and occurs in every zoological region. Be it pond, lake or stream, it is always possible to secure these tiny beings, hiding among the grasses or walking about the banks or stalking their game on the green fields of duck-weed floating on some placid pool. This genus also is dimorphic and some of its species polymorphic, and here again the winged and wingless forms are so notably different that they have frequently been taken for distinct species. The thoracic structures of the apterous forms also affords excellent differentiating characters. However, in the antennae we have such excellent characters that it is always possible to bring together both forms of any one species and to differentiate them from other species, even though closely related. This antennal character is largely employed in the following key since it is easily applicable to both the winged and wingless forms:

Key to Species.

1. Antennae longer than head and thorax taken together; posterior tibiae straight in both sexes 3
- Antennae equal to or shorter than head and thorax taken together 2
2. Antennae shorter than head and thorax taken together; posterior tibiae curved in male; female orbiculate, male elongate **borealis**
- Antennae equal to head and thorax taken together; posterior tibiae straight in both sexes; sexes similar in form **hinei**
3. First and third antennal joints subequal in length 4
- First antennal joint shorter than third, fourth subequal to second and third taken together. Hemelytra much marked with white; apterous form glabrous, slender **albonotata**
4. Fourth antennal joint much shorter than two and three taken together 5
- Fourth antennal joint slightly longer than second and third taken together **buenoi**
5. Apterous form with dorsal patches of silvery white pile; hemelytra in winged form unicolorous; a moderately large, stout form **americana**
- Apterous form with dorsal patches of blue-gray pile; winged form unknown; rather small, fusiform species **fontinalis**

M. americana (Uhler).

Stand. Nat. Hist. ii, 274, 1884. (As *Hebrus*.)

This species may be further separated from its relatives as follows: Fourth antennal joint is longer than third, first is longer than second, the second being the shortest; third is the thinnest, the others being of nearly equal diameter and the first is slightly curved. The hind femora extend slightly beyond the apex of the abdomen: the hind tibiae are straight in both sexes, and the hind tarsi two-jointed. Its life history and habits have been described.* Briefly, the bug overwinters in the adult stage, and early in spring emerges from its hibernaculum and proceeds to breed. The eggs are laid in a transparent glue and hatch out in about ten days, varying according to temperature. After five molts, it reaches the adult stage in some six weeks. As it begins to breed about April, it may have as many as four or five broods before the end of October. The adults and nymphs in all stages are frequently found in company. It seems to prefer the sloping banks of sluggish streams or ponds, or to perch on partly submerged sticks or on the sides of springs or water-holes in the outgrowing mosses. It is preëminently predaceous and will attack in force any insects struggling in the water. This species is widely distributed throughout the United States ranging over all the Eastern States and certainly south to Florida, west to the Mississippi, and has been reported from Colorado and Texas.

Cheshire, 6 May, Hamden, 25 May, 1911 (B. H. W.).

M. fontinalis Bueno.

Bull. Brook. Ent. Soc., xi, 58, 1916.

Only the wingless forms of this species is known. It is taken in numbers in a spring in a marshy woodland, where it clings to the long mosses growing into the water or walks about in leisurely style a short distance from the rocky sides of the basin. The blue-gray patches of pubescence on the dorsum are distinguishing characteristics. The characters given in the table will serve to distinguish it from *americana*, for small specimens of which it may be mistaken. In antennal structure it is near *albonotata*.

M. albonotata Champion. (*capitata* Bueno.)

Biol. Cent. Am., Heterop., ii, 129, pl. 8f, 17, 1898.

This species was described from a single winged male from Guatemala, Central America. It was subsequently recorded from Riverton, N. J., by Mr. E. P. Van Duzee and later secured at Westfield, N. J., by the writer. The specimens from the United States agree with a Mexican specimen in Kirkaldy's collection and with the type in the British Museum. In this species, as in the other, the most obvious character is in the long thin antennae, which are exceedingly characteristic. It cannot be mistaken for

* Canadian Entomologist, xlii, 176, 186, 1910.

any of the other species, as it is the largest of our Eastern forms, except *americana*, from which its slim body, long thin antennae and white-spangled hemelytra at once distinguish it. The apterous form is more glabrous and much less velvety in appearance than the winged forms. In addition to the original locality, and from the other states already mentioned, it is known from Georgia, where it was taken by Dr. J. C. Bradley.

This species has not been recorded from Connecticut.

M. borealis Bueno.

Bull. Brook. Ent. Soc., xi, 59, 1916.

This is the species that has appeared in the writer's papers as *pulchella* Westwood, from which it may be separated, aside from other characters, by having the first antennal joint longer than the second. It is also smaller, and *pulchella*, so far as is known to me, is only Antillean in distribution. This tiny bug is perhaps the most abundant of our native *Microvelias*, and it may always be found in large colonies on the matted *Lemna* or duckweed on still ponds. It is just as predaceous as its larger congeners and is most frequently found in the wingless form, although the fully winged is not rare. It begins to breed in the spring and lays its tiny eggs on the underside of the duckweed leaves with the head end toward the edge of the leaf, in the usual gelatine. The nymphs emerge in eight to thirteen days, and after *four* molts reach the adult stage in about sixteen days minimum, twenty-four days from the egg to the adult, which would allow for eight generations in the course of the summer. As one female may lay several batches of eggs, her progeny may be found in various instars at the same time. Attention is directed to the unusual number of molts, as the general rule in all Heteroptera is five, which in the known instances of deviation has been exceeded, but not lessened.

No Connecticut records are available.

M. buenoi Drake.

Bull. Brook. Ent. Soc., xv, 19, 1920.

No Connecticut records are at hand for this species, newly described from northern New York.

M. hinei Drake.

Ohio Jour. Sci., xx, 207, 1920.

This minute species, described originally from Ohio, was later found by Prof. H. M. Parshley in Northampton, Mass., and by myself in great abundance in White Plains, N. Y. It is so tiny a species it can easily be mistaken for a nymph of *borealis*, particularly since the two species are commonly found in company in secluded coves and shallow waters.

Family MIRIDAE (CAPSIDAE).*

By HARRY HAZELTON KNIGHT, PH.D.

The family Miridae, or Capsidae of older authors, is distinguished by having four-segmented antennae, four-segmented rostrum of which the first segment is as long or longer than the head, by absence of ocelli, tarsi three-segmented, wing membrane with only two cells or areoles, one longitudinal vein (anal vein), and by having a well developed cuneus in the wing (Fig. 47). The four-segmented antennae are usually slender, nearly linear or segment ii only slightly thickened apically, but more rarely strongly incrassated; segments iii and iv usually slender but in some forms distinctly thickened. The hemelytra are typically separated into clavus, corium, cuneus, and membrane, the embolium usually not clearly separated from corium; veins of membrane forming two cells, a smaller and a larger areole. The arolia, or pulvillae-like structures between the tarsal claws, in their modifications furnish the most reliable characters for separating the subfamilies.

In general, the species of Miridae are small to medium in size, usually rather fragile, broader than high and longer than broad; as viewed from above ovate to oblong, but at times very slender. Usually the male is more slender than the female. The body is variously clothed with fine hairs or pubescence, sometimes modified to form sericeous, or scale-like, deciduous pubescence; frequently the dorsum practically glabrous and strongly shining. The numerous species exhibit the greatest variety of color patterns, ranging from the most obscure to forms which are vivid red. Color varieties within the species are frequent, and the two sexes are more often differently colored, the male usually darker than the female.

Brachypterous and apterous forms occur throughout the family, and individuals of a single species may exhibit variation in this respect. Usually the male is macropterous even when the female is apterous, but the male may in rare cases also be apterous. Mimetic forms are rather numerous among the Miridae, especially those species described in genera closely related to *Pilophorus*.

Perhaps a majority of the species of Miridae are plant feeders, but a large number are now known to be chiefly predaceous. The predaceous habit is only partially developed in certain species, and thus animal blood serves merely to supplement the sap obtained from particular food plants. Probably the greater number of species are limited to a single host plant, or to a genus of plants, while a very few, such as *Lygus pratensis* Linnaeus and *Halticus citri* Ashmead, have a wide range of food plants. Forms which are chiefly predaceous are more frequently found on miscellaneous

* Contribution from the Department of Entomology, University of Minnesota.

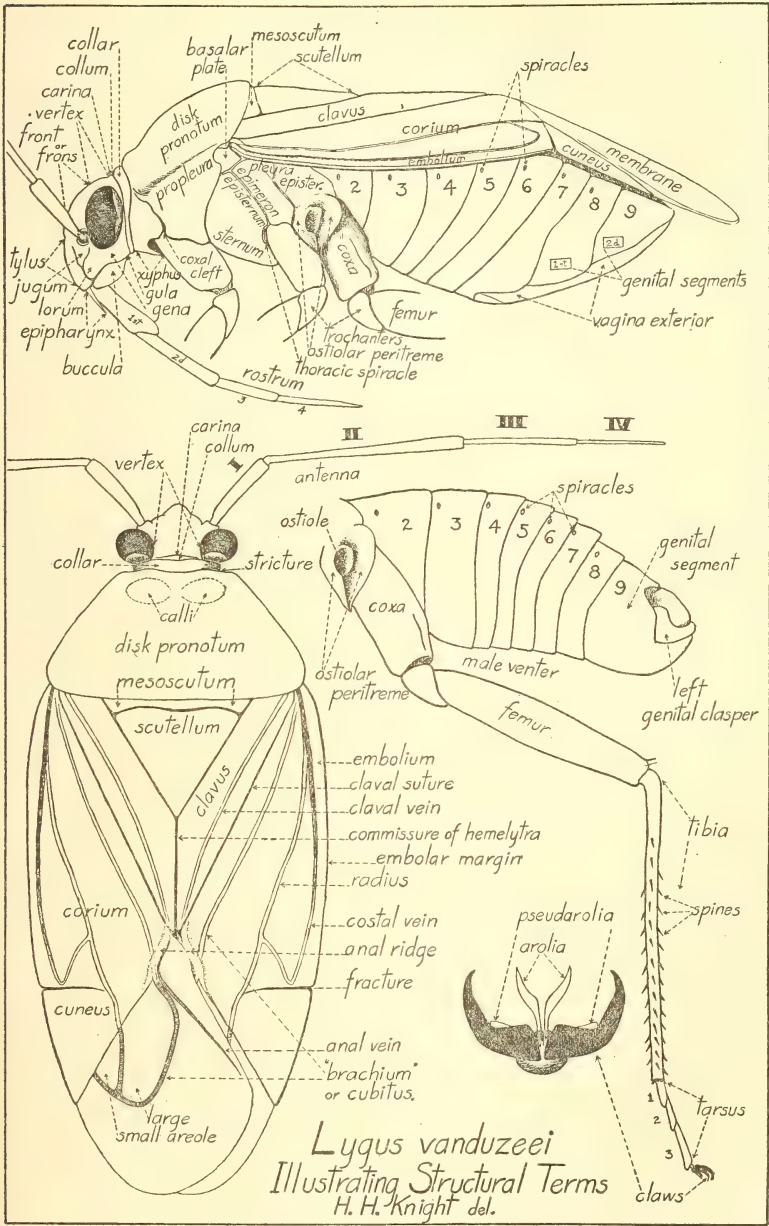


FIG 47. *Lygus vanduzeei* Knight,—illustrating the structural terms used in the classification of the Miridae. Greatly enlarged. Drawing by Dr. H. H. Knight.

plants. Even among species which always breed on a single host plant, a general dispersal of individuals usually takes place. Following the time of emergence and mating, individuals of *Tropidosteptes cardinalis* Uhler, *Lopidea staphyleae* Knight, and others, have been observed to migrate from their host plant to shrubbery in the general vicinity; from thence they doubtless become dispersed over wider territory and to new plants, although in the normal course of their life, eventually returning to suitable growth of the preferred host plant for the purpose of oviposition.

As regards the number of species, the Miridae by far outnumber all other families of Heteroptera. In the Palearctic region, where the total number of Heteroptera is best known,* one thousand

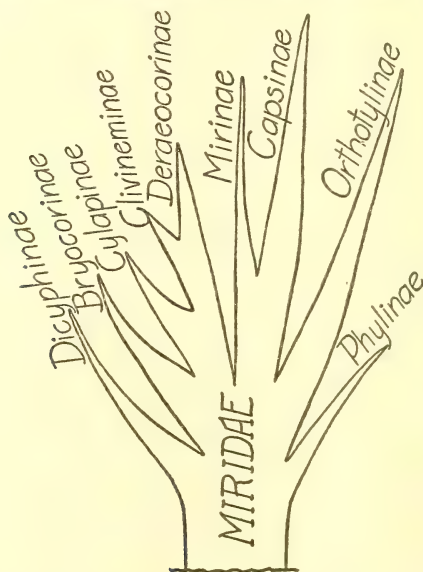


FIG. 48. A phylogenetic tree of the subfamilies of the Miridae. Drawing by Dr. H. H. Knight.

seventy-eight species are listed for the family Miridae while all other families of Heteroptera combined total but 2,486 species. The Oshanin Katalog enumerates 5,476 species of Heteroptera and Homoptera for the Palearctic region, from which it may be seen that the family Miridae forms nearly one-fifth of all the species of Hemiptera listed. This is perhaps a fair indication of what may be expected for the relative number of species of Miridae in North America, after our fauna has been more systematically collected and worked.

After considerable study of the arolia and genital structures in

* Katalog der palaarktischen Hemipteren (Heteroptera, Homoptera-Auchenorrhyncha und Psaloidae). 1912.

the family Miridae, the writer has arrived at certain conclusions regarding the relationships of the subfamilies. Perhaps the most significant change is in the elevation of the subfamily Orthotylinæ, from next to the lowest subfamily where Reuter placed it, to a place near the top of the series, or near to the Capsinæ and Mirinæ. When guided by the form of the arolia and the genital structures, we are dealing with the most fundamental characters yet proposed for classification of the subfamilies. On the basis of these structures, it may readily be seen from the figures accompanying this paper, that the subfamily Orthotylinæ is more closely related to the Capsinæ than any other subfamily. Reuter placed the Orthotylinæ next to the Phylinæ because of general similarity, chiefly on absence of pronotal collar, rather than relying on the form of the arolia. The present writer not only finds a close relationship between the erect, diverging and converging arolia (Fig. 49), but also in the highly developed and specialized character of the genitalia.

J. Sahlberg (1920) and Bergroth (1922) find reason to recognize in the Mirinæ of Reuter, two subfamilies, the Capsinæ and Mirinæ. Although both groups have erect arolia, divergent on the apical half, there are still very good characters for recognizing two subfamilies. Certainly the Mirinæ are more primitive than the Capsinæ. In addition to the characters given in the subfamily key, the Mirinæ may be judged more primitive as indicated by: (1) more generalized and little modified type of genitalia; (2) few genera and each with comparatively few species, but several of these are of world-wide distribution; (3) all the species breed on grasses or related lower plants. The Capsinæ, on the other hand, are more specialized and stand higher for the following reasons: (1) possess highly specialized genitalia; (2) numerous genera and species but having limited distribution; (3) the numerous species breed on a great variety of the higher plants, or plants of comparatively recent origin, also many species have developed predaceous habits.

The phylogeny of the Mirid subfamilies does not present a linear series of development, but more of a progression upward in several directions, and this perhaps may best be represented by a genealogical tree. A subfamily tree is appended (fig. 48) which will express more clearly the relationships within the family, based on the following characters which are listed in the order of their relative importance: (1) arolia; (2) genital structures; (3) biology; (4) modifications of the thorax.

Key to subfamilies of Miridae.

(Figure numbers refer only to Figure 49.)

1. Arolia present, erect and prominent (fig. 49: 33-60); or pseud-arolia very prominent, usually with bristle-like arolia also present (fig. 49. 13-20, 22-24) 6

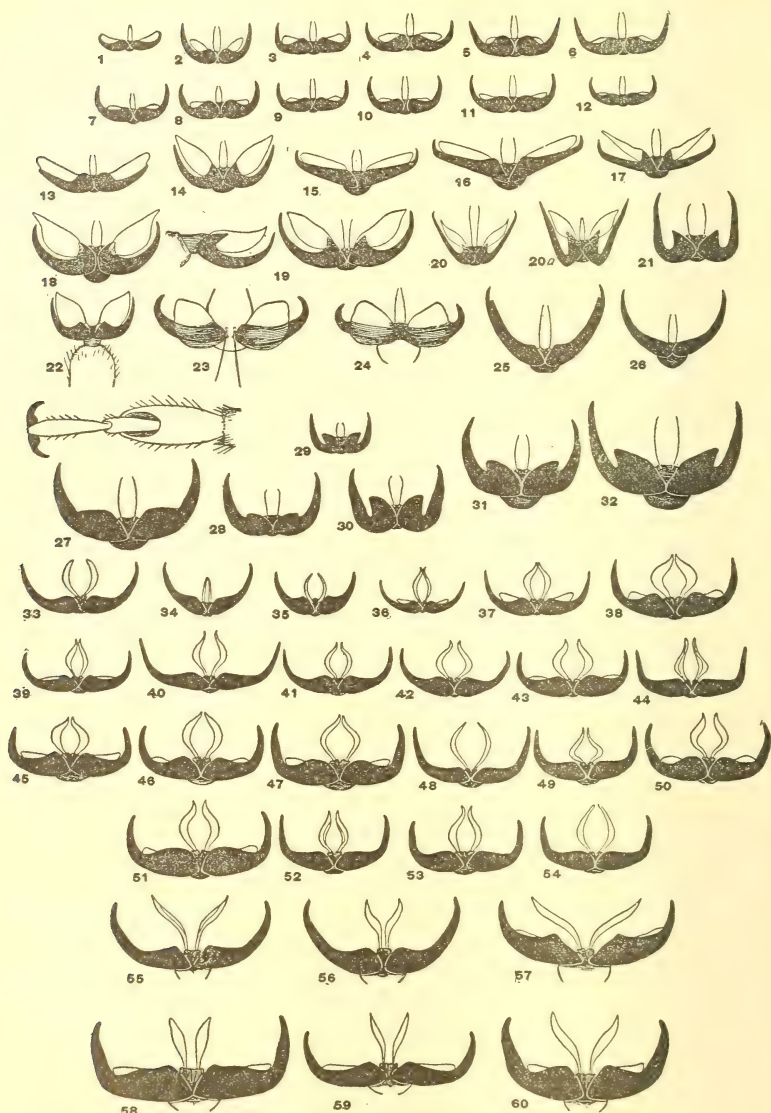


FIG. 49. Tarsal claws and arolia of Miridae. Greatly enlarged. PHYLINAE, tribe PHYLINI, Nos. 1-12.—(1) *Chlamydatius associatus* Uhler. (2) *Reuteroscopus ornatus* Reuter. (3) *Lepidopsallus rubidus* Uhler. (4) *Microsynamma bohemanii* Fallen. (5) *Rhinocapsus vanduzeei* Uhler. (6) *Criocoris saliens* Reuter. (7) *Psallus ancorifer* Fieber. (8) *Lepidopsallus minusculus* Knight. (9) *Campylomma verbasci* Meyer. (10) *Plagiognathus obscurus* Uhler. (11) *Plagiognathus annulatus* Uhler. (12) *Microphylellus modestus* Reuter. PHYLINAE, tribe ONCOTYLINI, Nos. 13-14—(13) *Lopus*

- Arolia absent, or present but bristle-like in form (fig. 49: 25-32), sometimes difficult to distinguish from hairs on tarsus; pseud-
 arolia absent, or present but small in size (fig. 49: 1-12) 2
2. Prothorax simple, destitute of an apical stricture, sometimes with
 a flattened apical area suggesting a collar but not separated off
 by a distinct incised line; male genitalia distinctive, the tip of the
 penis twisting to the left, lying closely within the bend of left
 clasper, extending downward and beyond it to the left side
 PHYLINAE, p. 428
- Prothorax provided with an apical stricture, sometimes fine and
 shallow, when apparent only at the sides an impressed line extends
 back to rear of calli; male genitalia not as the above 3
3. Claws thick, either sharply bent (fig. 49: 21), or broadly curved
 (fig. 49: 27), or more sharply curved and cleft near base (fig.
 49: 28-32) 4
- Claws simple and slender, rarely widely spread (fig. 49: 25-26);
 tibiae weakly spinose, long and tapering apically or else greatly
 shortened; in the latter case segment i of the tarsi is unusually
 long, the head transverse and eyes strongly protruding
 CYLAPINAE, p. 479
4. Pronotum with annuliform apical stricture 5
- Pronotum with an apical gibbosely convex area; stricture apparent
 only at the sides from which an impressed line extends to rear
 of the calli CLIVINEMINAE, p. 480
5. Hemelytra hyaline, glassy, ovate, with a sharply defined inverted
 Y-shaped red or fuscous mark (*Hyaliodes*)
 DICYPHINAE (pars) p. 476
- Hemelytra not hyaline or glassy; claws usually cleft near base,
 arolia bristle-like but pseudarolia absent DERAECORINAE, p. 481
6. (1) Pseudarolia very prominent, obscure bristle-like arolia also
 present between claws at base (fig. 49: 13-20, 22-24) 7

decolor Fallen. (14) *Macrotylus sexguttatus* Provancher. PHYLINAE, tribe
 HALLODAPINI, Nos. 15-17. (15) *Teleorhinus davisii* Knight. (16) *Orecto-*
derus obliquus Uhler. (17) *Coquillettia mimetica* Osborn. DICYPHINAE,
 Nos. 18-21. (18) *Macrolophus separatus* Uhler. (19) *Dicyphus agilis*
 Uhler. (20) *Dicyphus discrepans* Knight. (20a) *Dicyphus famelicus*
 Uhler. (21) *Hyaliodes vitripennis* Say. BRYOCORINAE, Nos. 22-24. (22)
Monalocoris filicis Linnaeus. (23) *Pycnoderes dilatatus* Reuter. (24)
Sixeonotus insignis Reuter. CYLAPINAE, Nos. 25-26. (25) *Cylapus tenui-*
cornis Say. (26) *Fulvius brunneus* Provancher. CLIVINEMINAE, No. 27.
 (27) *Largidea davisii* Knight,—claws and hind tarsus. DERAECORINAE,
 Nos. 28-32. (28) *Deraeocoris pemicola* Knight. (29) *Deraeocoris nebulosus*
 Uhler. (30) *Deraeocoris ruber* Linnaeus. (31) *Eurychlopterella luridula*
 Reuter. (32) *Eustictus venatorius* Van Duzee. ORTHOTYLINAE, Nos. 33-54.
 (33) *Labops hirtus* Knight. (34) *Semium hirtum* Reuter. (35) *Partheni-*
cus vaccini Van Duzee. (36) *Halticus citri* Ashmead. (37) *Halticus*
intermedius Uhler. (38) *Strongylocoris stygicus* Say. (39) *Orthocephalus*
mutabilis Fallen. (40) *Sericophanes heidemanni* Poppius. (41) *Alepidia*
gracilis Uhler. (42) *Pilophorus amoenus* Uhler. (43) *Pseudoxenetes scutel-*
latus Uhler. (44) *Ceratocapsus modestus* Uhler. (45) *Lopidea robiniae*
 Uhler. (46) *Hadronema militaris* Uhler. (47) *Inacora malina* Uhler. (48)
Orthotylus flavosparsus Sahlberg. (49) *Orthotylus catulus* Van Duzee.
 (50) *Orthotylus dorsalis* Provancher. (51) *Heterocordylus malinus* Reuter.
 (52) *Mecomma gilvipes* Stål. (53) *Reuteria irrorata* Say. (54) *Diaph-*
nia pellucida Uhler. MIRINAE, Nos. 55-56. (55) *Pithanus maerkeli*
 Herrich-Schaeffer. (56) *Stenodema trispinosum* Reuter. CAPSINAE, Nos.
 57-60. (57) *Barberiella apicalis* Knight. (58) *Platytyellus insitivus* Say.
 (59) *Phytocoris lasiomerus* Reuter. (60) *Lygus vanduzeei* Knight.
 Drawing by Dr. H. H. Knight.

- Arolia prominent, always arising approximate at base between the claws (fig. 49: 33-60), never connate with them but sometimes minute pseudarolia are also apparent on the inner curve of the claw (fig. 49: 45-47, 58-60); free, more or less linear, converging or diverging at the apices 9
7. Ultimate tarsal segment incrassate (fig. 49: 22), always thicker than the preceding; pseudarolia broadly involving the claws (fig. 49: 22-24); tibiae destitute of spines; lora confluent with genae BRYOCORINAE, p. 478
- Ultimate tarsal segment linear; pseudarolia not as the above; lora usually distinctly separated from the genae 8
8. Prothorax simple, without annuliform apical stricture, certain forms with a somewhat flattened apical collar but in such case the abdomen is constricted at base and the claws curved only at extreme tips (fig. 49: 15-17); male genitalia distinctive, the tip of penis twisting to the left, lying closely within bend of left clasper, extending downward and beyond it to the left side PHYLINAE, p. 428
- Prothorax with annuliform apical stricture, sometimes obsolete above in the middle but forming a distinct collar; claws usually sharply bent (fig. 49: 18-20); male genitalia not as the above DICYPHINAE, p. 476
9. (6) Arolia diverging at their apices (fig. 49: 55-60) 10
- Arolia converging at their apices (fig. 49: 33-54) ORTHOTYLINAE, p. 497
10. Prothorax without ring-like apical constriction, often with sulcus impressed near front margin of calli but never extending over the sides; lateral margins of disk usually carinate to anterior angles; first tarsal segment much longer than segment ii and equal in thickness; tarsal segments scarcely overlapping at joints and thus very flexible (straw-climbers) MIRINAE, p. 545
- Prothorax with a ring-like apical constriction which extends over the sides and beneath, sometimes obsolete on median line above, and more rarely it may be entirely absent but in such case the abdomen is constricted at base; lateral margins of disk frequently carinate but never extending forward upon collar; first tarsal segment short, rarely longer than segment ii except in the Resthenini, but when longer, the pronotal collar very distinct and segment i much thicker than segment ii; tarsal segments with tips overlapping at joints and thus practically inflexible (leaf-walkers) CAPSINAE, p. 550

Subfamily PHYLINAE.

Key to Tribes.

1. Pronotum without flattened apical collar; abdomen not constricted at base 2
- Pronotum with a more or less flattened apical collar but without distinct stricture separating it posteriorly; abdomen usually distinctly constricted at base, usually elongate forms (p. 474) **Hallodapini**
2. Prosternal xyphus convex, not distinctly margined, pseudarolia minute or wanting (fig. 49: 1-12), connate upon the inner angle of the claw and rarely projecting free for a space greater than the base of attachment, nor extending beyond tips of claws ... **Phylini**
- Prosternal xyphus depressed on its disk, its margins more or less elevated; pseudarolia connate for the full length and frequently projecting beyond tips of the claws (fig. 49: 13), or attached only at the basal angles and extending free and parallel with them to the tips (fig. 49: 14) (p. 473) **Oncotylini**

Tribe **PHYLINI.***Key to Genera.*

1. Pubescence normal, composed of a single type of fine, chiefly erect pubescent hairs, sometimes nearly glabrous 2
 Pubescence composed of closely appressed, tomentose or scale-like deciduous hairs, and usually interspersed with more erect pubescent hairs 7
2. Head more or less produced, facial angle (when viewed from the side, the angle formed by the contour line of the tylus and lower margin of the buccula) less than a right angle; length of antennal segment ii greater than width of head 4
 Head not or scarcely produced, facial angle forming a right angle or practically so; length of antennal segment ii not or scarcely exceeding width of head 3
3. Pseudarolia minute, not extending beyond middle of claw (fig. 49: 9); small, pale to yellowish species, the legs spotted (p. 430) **Campylomma**
 Pseudarolia involving the claws to the apices or nearly so (fig. 49: 1); small black species but with legs more or less pale .. (p. 430) **Chlamydatus**
4. Vertex with an impression each side near margin of eye; hind tarsi with second and third tarsal segments subequal (p. 460) **Microsynamma**
 Vertex without impression at each side; hind tarsi with third segment slightly shorter than the second 5
5. Tibiae pale, spines dark but without black spot at base 6
 Tibiae chiefly pale, spines with black spot at base, or if not, then the dorsum and tibial spines also pale. (p. 431) **Plagiognathus**
6. Antennal segment ii incrassated, at least equal in thickness to segment i; color chiefly reddish but hemelytra and venter darkened with fuscous (p. 459) **Rhinocapsus**
 Antennal segment ii more slender, never attaining the thickness of segment i; body chiefly blackish but sometimes with pale (p. 454) **Microphylellus**
7. (1) Antennal segment ii strongly incrassated, the female of *Criocoris* excepted, but in that case black in color and the head sharply produced beyond the eyes 8
 Antennal segment ii slender in both sexes, never exceeding thickness of segment i 9
8. Head sharply produced beyond the eyes; segment ii strongly incrassated in the male, slender in the female (p. 460) **Criocoris**
 Head not or scarcely produced, inclined or subvertical in position; segment ii incrassated in both sexes (p. 461) **Atractotomus**
9. Pseudarolia attached only at base of claw, tips free and extending to middle of claw (fig. 49: 2); greenish yellow species with fuscous on hemelytra (p. 462) **Reuteroscopus**
 Pseudarolia minute, connate and not extending free for a space greater than the base of attachment 10
10. Antennae short, length of segment ii not equal to width of head; short ovate forms, clothed with closely appressed scale-like hairs but interspersed with erect pubescent hairs; tibiae black, strongly spinose (p. 470) **Lepidopsallus** n. gen.
 Antennae longer, length of segment ii equal to or greater than width of head; pubescence variable but always composed of two types of hairs; tibiae sometimes dark but more frequently pale and spotted with darker (p. 462) **Psallus**

Campylomma Reuter.**C. verbasci** (Meyer).

Capsus verbasci Meyer, Verz. Schw. Rhyn., 70, pl. 4, fig. 1, 1843.

Reuter, Hem. Gymn. Eur., i, 53, pl. 3, fig. 6, 1878.

Length male 2.5 mm., width 1.1 mm.; female length 2.9 mm., width 1.3 mm. Pale testaceous to yellowish, mesoscutum and base of scutellum becoming fulvous, disk of cuneus pale fuscous; tylus, apical half of antennal segment i and slender base of ii, large spots on femora and tibiae, black; body beneath dark fusco-brownish; clothed with simple, dusky to blackish pubescence; membrane uniformly pale fumate.

Breeds on mullein (*Verbascum* sps.); occasionally breeds on apple; sometimes is attracted to colonies of aphids where it feeds on honey dew.

Branford, 28 July, 1905 (H. W. W.); Hamden, 14 June, 1911 (W. E. B.); New Haven, 21 June, 1909 (B. H. W.); Westville, 6 Aug., 1905 (W. E. B.); North Haven, 3 Aug., 1905 (H. L. V.).

Chlamydatus Curtis.**C. associatus** (Uhler).

Hayden's Surv. Terr., Rept. for 1871, p. 419, 1872.

Length 2.5 mm., width 1 mm.; black; front and middle legs, hind tibiae, and first two segments of all the tarsi, yellowish; antennal segments iii and iv pale fuscous.

Food plant: Rag weed (*Ambrosia*).

Cornwall, 10 Aug., 1919 (B. H. W.); New Haven, 28 Aug., 1910, 12 Sept., 1904 (B. H. W.).

C. suavis (Reuter).

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 92, 1876.

Length 2.28 mm., width .97 mm.; slightly smaller than *associatus*, entirely black except the tibiae which are pale yellow.

Food plant: Rag weed (*Ambrosia*).

New Jersey. Staten Island, N. Y.

C. pulicarius (Fallen).

Lygaeus pulicarius Fallen, Mon. Cim. Suec., 95, 1807.

Reuter, Hem. Gymn. Eur., i, 60, pl. 3, fig. 8, 1878.

Male: Length 2.8 mm., width 1.69 mm.; ovate, embolar margin distinctly arcuate; membrane short, its area not exceeding size of cuneus; black, apical half of femora more or less, tibiae, and tarsi, pale; antennae pale, segment ii except apex, and base of segment i, black; tibial spines black, a fuscous spot at base of each; clothed with fine yellowish to dusky, adpressed pubescent hairs.

Female: Length 2.9 mm., width 1.61 mm.; very similar to the male but more robust, the legs and antennae usually more broadly pale.

Breeds on *Plantago*.

New York.

Plagiognathus Fieber.*Key to Species.*

1. Tibial spines dark and with black spot at base of each, sometimes obsolete apically 2
 Tibial spines pale, without black spots at base; general color pale, with two black lines on antennal segment i and a slender black line on segment ii, also the dorsal and the ventral margins of femora with a black line forming apically (p. 443) *nigrolineatus* n. sp.
2. Antennal segment ii dark fuscous to black, sometimes slightly paler at middle but always more black than pale 3
 Antennal segment ii chiefly pale, blackish only at base 20
3. Cuneus with blackish, entirely black or blackish only at apex, never chiefly brown 4
 Cuneus pale, or uniformly fulvous to dark brown, sometimes dusky at apex but never distinctly black 15
4. Cuneus more or less pale at base 5
 Cuneus uniformly black like the corium, rarely somewhat pale at the fracture 10
5. Scutellum uniformly black 8
 Scutellum with pale, sometimes pale only on apex or along lateral margins 6
6. Scutellum pale along median line, sometimes pale only at apex, or broadly pale and leaving only the basal angles blackish 7
 Scutellum black along median line, thus leaving lateral margins more or less pale (p. 438) *obscurus*
7. Femora pale to fulvous, hind pair with two rows of prominent black spots, sometimes becoming obscured with darker but never distinctly blackish at base and with paler at middle; cuneus pale at base and along outer margin; length 3.9-4.5 mm.
 (p. 440) *flavoscutellatus* n. sp.
 Femora pale to black, usually blackish at base and paler on middle, in dark specimens the femora black with only apices pale; cuneus pale at base but not along outer margin; length 3.8-4 mm.
 (p. 434) *politus* var. *flaveolus* n. var.
8. (5) Pronotum and hemelytra black, a small pale lunule at base of cuneus 9
 Pronotum pale apically, corium chiefly pale testaceous or ivory-white, but with a large, somewhat ovate, fuscous spot on apical half; cuneus pale, with a small black spot at apex (p. 439) *fraternus*
9. Femora black, pale on apices; pubescence white; length 3.5 mm.
 (p. 434) *politus*
 Femora yellowish, with one or two rows of black spots on anterior face; pubescence yellowish to golden; length 4 mm.
 (p. 442) *annulatus* var. *cuneatus* n. var.
10. (4) Rostrum and legs black or obscured with blackish 12
 Rostrum and legs chiefly yellowish, femora spotted, or spotted and marked with black lines 11
11. Smaller, length 3-3.2 mm.; femora with a few small black spots visible but never forming black line above or below; hemelytra uniformly black, cuneus never pale at base .. (p. 453) *repetitus* n. sp.
 Larger, length 3.8-4.5 mm.; hind femora with four or five black spots on apical half of anterior aspect, a black line forming above and one on ventral margin of apical half (p. 442) *annulatus*
12. Femora black except on extreme tips, tibiae pale but with prominent black spots 13
 Femora, tibiae, and antennae obscured with brownish black; antennal segment iii dusky to fuscous, scarcely paler than segment ii;

- hemelytra brownish black, somewhat translucent, pubescence yellowish to dusky; length 4 mm. (p. 452) *laricicola* n. sp.
13. Length of antennal segment ii greater than width of head plus width of vertex; larger, length 4.2-4.5 mm. 14
Length of antennal segment ii not equal to width of head plus width of vertex; deep black, strongly shining, pubescence white; smaller, length 3 mm. (p. 435) *nigronitens* n. sp.
14. Rostrum reaching upon hind coxae; brownish black, sometimes slightly translucent at cuneal fracture
(p. 443) *annulatus* var. *nigrofemoratus* n. var.
Rostrum only reaching to middle of intermediate coxae; black, cuneus uniformly black like the corium (p. 441) *nigritus* n. sp.
15. (3) Cuneus, and whole dorsum as well, chiefly fulvous, sometimes the scutellum and clavus slightly darker; tylus and lora black .. 16
Cuneus and dorsum not distinctly fulvous, or with cuneus fulvous but apical half of corium black 17
16. Antennal segment ii exceeding width of pronotum at base
(p. 446) *rosicola* n. sp.
Antennal segment ii not equal to width of pronotum at base
(p. 447) *fulvidus* n. sp.
17. Scutellum fuscous to blackish, or with a blackish median line .. 18
Scutellum uniformly pale or green (p. 444) *blatchleyi*
(a) Pronotum and hemelytra uniformly yellowish testaceous or greenish variety *blatchleyi* typical
(b) Basal half of pronotal disk, apical half of corium, and disk of clavus, darkened with fusco-brownish or blackish
variety *nubilus* n. var.
18. Rostrum extending beyond middle coxae, usually attaining hind margins of posterior coxae 19
Rostrum not extending beyond middle coxae; hemelytra black, basal one-third to one-half of embolium and corium, pale; cuneus pale to fulvous, apex frequently dusky; length 4.3-4.7 mm. (p. 441) *brevirostris* n. sp.
19. Corium with pale area finding its distal limit along the claval suture; smaller forms, length 3.7-4.6 mm.
(p. 438) *obscurus* var. *albocuneatus* n. var.
Corium with pale area finding its distal limit along the radial vein; females with fuscous area on apical half of corium divided into two spots by the pale color which extends along radius and joins that of cuneus, larger forms, length 4.5-4.9 mm.
(p. 439) *alboradialis* n. sp.
20. (2) Scutellum, and usually the whole dorsum as well, black 21
Scutellum pale or fulvous, sometimes dark brownish, frequently the median line blackish but the basal angles distinctly paler; hemelytra more or less pale, in darkest forms brownish black but always somewhat translucent 26
21. Hemelytra uniformly black, or blackish with pale 22
Hemelytra uniformly brownish translucent; thorax and scutellum black (p. 454) *suffuscipennis* n. sp.
22. Cuneus chiefly black, basal angle of corium not or scarcely pale 23
Cuneus pale or reddish (p. 437) *albonotatus* n. sp.
(a) Cuneus, and basal one-third or more of corium, pale; femora clouded with blackish, spots rarely visible
variety *albonotatus* typical
(b) Cuneus reddish, basal area of corium tinged with reddish; hind femora with two rows of distinct spots, scarcely clouded with fuscous variety *tinctus* n. var.
23. Femora black, pale only at the apices 25
Femora pale or fulvous, usually spotted with black 24
24. Hind femora with two rows of prominent black spots on anterior face; antennal segment i black, slenderly pale at apex, segment

- ii black at base for a space equal to one-third the length of segment i (p. 450) *punctatipes* n. sp. 2
- (a) Cuneus uniformly black like the corium; length 3.6-3.8 mm. variety *punctatipes* typical 2
- (b) Cuneus narrowly pale at base; more slender, length 3.3 mm. variety *dispar* n. var.
- Hind femora pale, a single black spot on lower margin near apex; antennal segment i pale, blackish at base, segment ii black at base for a space equal to half the length of segment i (p. 452) *davisi* n. sp.
25. Cuneus pale at base; antennal segment ii blackish on basal one-fourth (p. 435) *politus* var. *pallidicornis* n. var. 1
- Cuneus uniformly black like the corium; antennal segment ii narrowly black at base, the apex dusky; more ovate, deep black, strongly shining (p. 436) *flavicornis* n. sp.
26. (20) Dorsum uniformly greenish yellow, clothed with prominent black pubescence; antennae with base of segments i and ii, and a second annulus forming before apex of segment i, black (p. 444) *chrysanthemi*
- Dorsum darkened or marked with fuscous, pubescence pale; antennae not marked as the above 27
27. Antennal segment ii black at base 28
- Antennal segment ii uniformly pale, sometimes narrowly dusky at base, segment i black; scutellum and cuneus pale; femora with black spots (p. 445) *albatus*
- (a) Scutellum and cuneus pale variety *albatus* typical
- (b) Median line of scutellum and apical half of cuneus blackish variety *vittiscutis* n. var.
28. Scutellum with median line blackish, pale or fulvous on each side 30
- Scutellum uniformly colored, or with median line paler than basal angles 29
29. Femora pale or fulvous, distinctly spotted in linear series with black; scutellum uniformly pale or with median line pale and basal angles dark; rosy pink or fulvous and tinged with dark brown .. (p. 448) *delicatus* 2
- Femora rather uniformly dark except apices, black spots indistinct; scutellum uniformly colored, usually dark fusco-brownish or ligneous, similar to the whole dorsum (p. 450) *cornicola* n. sp.
30. Cuneus uniformly pale 31
- Cuneus with fuscous or blackish apically 32
31. Rostrum scarcely attaining hind margins of middle coxae; propleura clothed only with slender pubescent hairs; femora distinctly spotted with black although at times slightly obscured apically with fuscous (p. 449) *repletus* n. sp. 27
- Rostrum extending beyond middle coxae; propleura clothed with sericeous pubescence; femora more or less black on apical half but scarcely forming distinct spots (p. 438) *albonotatus* var. *compar* n. var
32. Rostrum not attaining hind margins of posterior coxae 33
- Rostrum attaining hind margins of posterior coxae; basal half of corium and more or less broadly each side of claval suture, white; pale areas never fulvous, dark areas distinctly black (p. 445) *albatus* var. *similis* n. var. 2
33. Hemelytra except along basal half of radius, dark brown or fusco-brownish; yellowish testaceous to fulvous, sides of pronotal disk and median line of scutellum dark fusco-brownish (p. 448) *caryae* n. sp.
- Hemelytra black, outer half of clavus, basal half of corium and extending along claval suture to apex, pale translucent (p. 449) *repletus* var. *apicatus* n. var. 2

P. politus Uhler.

Uhler, Hemip. Colo., 52, 1895.

Male: Length 3.5 mm., width 1.3 mm.; ovate, shining black, femora dark fuscous to black, apices pale; rostrum slightly surpassing hind coxae, yellowish on middle; antennae black, tip of segment i pale, iii and iv pale or only tinged with fuscous; tibiae pale or yellowish, knees, and spines with spots at base, black; clothed with simple, pale or white pubescence.

Female: Length 3.8 mm., width 1.6 mm.; very similar to the male but more robust.

Food plants: Ragweed (*Ambrosia* sps.); occurs on various weeds; reared from apple where the nymphs fed on the tender foliage.

The original description for *P. fuscus* (Provancher, 1872) agrees, in so far as it goes, with *politus* Uhler, except that the size is indicated slightly too large. Provancher states that the species is "commun sur les plantes" which is more evidence that the form he described probably refers to *politus* Uhler. The present writer has found no other species which agrees so well with the color characters given for *fuscus*, and at the same time it may be added that *politus* is found very commonly on several plants. Provancher's redescription for *fuscus* (1887) cannot apply to the originally described species, and that reference is very properly cited by Van Duzee (1912) as a misidentification of *obscurus* Uhler.

Cornwall, 5 July, 1919 (B. H. W.); Hamden, 17 July, 1920 (M. P. Z.); New Canaan, 17 Sept., 1918 (B. H. W.); New Haven, 7 July, 1920 (B. H. W.); Westport, 24 June, 1921 (W. E. B.).

***P. politus** var. *flaveolus* Knight, new variety.

Apparently not differing structurally from the typical *politus* but having a different color aspect.

Black; scutellum largely, base and apex of embolium, base of corium slightly, narrowly bordering claval suture, basal half of cuneus, and more or less broadly on middle of femora, somewhat pale or yellowish.

This form appears late in the season, no doubt belonging to the second brood of *politus*, breeding on *Solidago* and related herbaceous plants.

Holotype: Male, 1 Sept., 1915, Batavia, N. Y. (H. H. Knight); author's collection. Paratypes: CONNECTICUT—Female, Aug., 1910, East River (C. R. Ely). Female, 16 Oct., 1903, New Haven (H. L. Viereck). ILLINOIS—Female, 30 Aug., 1899, Algonquin; Females (2), 13 Sept., 1909, Urbana (C. A. Hart). MASSACHUSETTS—Male and female, 22 Aug., female, 27 Aug., males (4) and females (4), 31 Aug., 1914, females (2), Sept., 1915, Beach Bluff (H. M. Parshley). Female, 17 June, 1914, Boston; females (2), 21 Sept., 1914, Cohasset (H. M. Parshley). Female, 15 Aug., 1914, Farmington (C. A. Frost), at light. Female, 19 Sept., 1914, males and females, 14 Sept., males (2), 30 Sept., female, 4 Oct., 1915, Forest Hills; male and female, 13 Aug., 1918, Northampton; males (2) and females (2), 2 Sept., 1915, female, 5 Sept., female, 7 Sept., 1914, Saugus

(H. M. Parshley). Male, 10 July, 1915, Atherton, Mo. (C. F. Adams). NEW YORK—Males (2) and females (3), 1 Sept., females (2), 2 Sept., 1915, Batavia (H. H. Knight). Males and females (6), 9 Sept., 1917, Yorktown Heights; females (2), 2 Sept., 1916, Forest Hill, Long Island; Male and females (2), 16 Sept., 1917, Maspeth (C. E. Olsen). Males and females (6), 10 Sept., 1915, Honesdale, Pa. (C. E. Olsen).

**P. politus* var. *pallidicornis* Knight, new variety.

Structurally not differing materially from the typical *politus* but the unusual color combination makes it desirable to name this variety for reference in the key. Antennae pale, segment i and base of ii black; cuneus with only a pale lunule at base like the typical form; membrane uniformly fuscous, narrowly pale bordering cuneus and veins.

Holotype: Male, 27 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: CONNECTICUT—Male and female, 20 July, 1916, Guilford (B. H. Walden). Male, 13 July, 1920, North Branford (B. H. Walden). Female, 1 June, 1915, South Meriden (H. Johnson). Male, 22 July, 1920, Berrien County, Mich. (R. F. Hussey). MAINE—Male, 19 June, male and female, 26 June, 1909, Machias (C. W. Johnson). Male and female, 15 July, 1914, Monmouth (C. A. Frost). Female, 5 July, female, 14 July, 1905, Orono. MASSACHUSETTS—Female, 8 Aug., 1912, Washington (C. W. Johnson). MINNESOTA—Males and females (14), 12 July, 1919, Hennepin County (H. H. Knight). NEW HAMPSHIRE—Male, 28 Sept., 1916, Crawfords (H. M. Parshley). Male, 24 July, 1915, Glenhouse; male, 3 July, 1915, Hanover (C. W. Johnson). NEW YORK—Males and females (18), topotypic. Male, 30 July, 1913, male, 24 June, female, 30 June, male, 12 July, females (2), 13 July, 1914, male, 27 July, female, 14 Aug., 1915, female, 4 Aug., 1916, Batavia; males (3) and females (2), 27 July, 1916, McLean; female, 22 Aug., 1916, Whiteface Mt. (H. H. Knight). Male, 3 Aug., 1920, Wanakena (C. J. Drake). ONTARIO—Female, 6 Aug., 1915, Parry Sound (H. S. Parish).

Plagiognathus nigronitens Knight, new species.

Slightly smaller than *politus*, the rostrum shorter; shining black, the cuneus uniformly black like the corium.

Male: Length 3 mm., width 1.2 mm. Head: Width .64 mm., vertex .33 mm.; black, scarcely paler at vertex. Rostrum, length .91 mm., scarcely attaining hind margins of intermediate coxae.

Antennae: Segment i, length .22 mm., black; ii, .78 mm., black, extreme tip pale; iii, .66 mm., pale; iv, .45 mm., pale to dusky.

Pronotum: Length .53 mm., width at base 1.03 mm.; black, clothed with fine, pale yellowish pubescence, a prominent black hair at each anterior angle. Scutellum black, minutely transversely rugulose; sternum black, opaque; ostiolar peritreme black or only slightly yellowish.

Hemelytra: Embolar margins very slightly arcuate; uniformly black, shining, the cuneus not at all paler at basal margin; clothed with pale yellowish pubescence. Membrane uniformly pale fuscous, a pale triangular spot bordering apex of cuneus; veins scarcely paler except tip of brachium.

Legs: Black, femora paler at extreme tips; tibiae yellowish, spines with black spots at base, hind pair becoming infuscated on

basal one-third; tarsi pale, apical segment blackish. Venter shining black.

Female: Length 3 mm., width 1.3 mm.; very slightly more robust than the male but very similar in coloration.

Holotype: Male, 27 July, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (14), topotypic. MASSACHUSETTS—Female, 24 July, 1914, Beach Bluff (H. M. Parshley). Male, 3 July, 1914, Danvers (C. W. Johnson). Male and females (3), 26 July, 1916, Pigeon Cove (C. E. Olsen). Male, 13 July, 1905, Springfield (C. W. Johnson). MICHIGAN—Female, 5 July, 1919, Berrien County (R. F. Hussey). Males (2), 15 July, 1914, Grand Junction. MINNESOTA—Males and females (9), 12 July, 1919, Hennepin County (H. H. Knight). NEW JERSEY—Female, 27 June, 1908, Lakehurst (Wm. T. Davis). NEW YORK—Female, 6 July, 1915, Wyoming County (H. H. Knight). Males and females, 31 July, 1915, White Plains (J. R. Torre-Bueno). ONTARIO—Males and females, 10 July, 1915, Parry Sound (H. S. Parish).

Plagiognathus flavicornis Knight, new species.

Larger and more robust than *nigronitens*, about the size of *politus* but antennal segment ii pale except narrowly at base while the cuneus remains uniformly black like the corium.

Male: Length 3.5 mm., width 1.6 mm. Head: Width .73 mm., vertex .38 mm.; blackish, vertex and front yellowish brown. Rostrum, length 1.11 mm., scarcely attaining hind margins of intermediate coxae.

Antennae: Segment i, length .28 mm., black, apex pale; ii, 1.16 mm., pale yellow, narrowly black at base, the apex dusky; iii, .83 mm., fuscous, slightly paler at base; iv, .55 mm., fuscous.

Pronotum: Length .61 mm., width at base 1.16 mm.; black, shining, clothed with pale yellowish pubescence, a prominent black hair at each anterior angle. Scutellum black, minutely transversely rugulose. Sternum and ostiolar peritreme black, opaque.

Hemelytra: embolar margins moderately arcuate, more distinctly so than in *politus*; uniformly black, shining, the cuneus not at all paler on basal margin; clothed with yellowish to dusky pubescence. Membrane and veins uniformly dark fuscous, scarcely paler bordering cuneus.

Legs: Black, apices of femora pale; tibiae pale, knees, and spot at base of spines, black, spots much reduced or absent on apical one-third. Venter black, shining.

Female: Length 3.3 mm., width 1.6 mm.; very similar to the male in coloration but in form more robust; embolar margins distinctly arcuate, hemelytra much broader on apical half than at base.

Food plant: *Myrica gale*.

Holotype: Male, 27 July, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: ILLINOIS—Male and females (6), 4 Aug., 1906, bog at Cedar Lake (C. A. Hart). MASSACHUSETTS—Male, 3 Aug., 1918, Oak Bluffs; male and female, 15 July-6 Aug., 1917, Woods Hole (C. E. Olsen). Female, 1 Aug., female, 13 Aug., female, 27 Aug., Swampscott (H. M. Parshley). MINNESOTA—Males and

females, 10 Aug., 1922, Cramer (H. H. Knight), collected on *Myrica gale*. NEW YORK—Male and female; topotypic. Female, 30 June, male, 8 July, females (2), 11 July, 1914, Batavia (H. H. Knight). ONTARIO—Male, 20 July, 1912, Ottawa (Beaulieu).

P. albonotatus Knight, new species.

Nearly the size of *politus* but slightly more robust; antennal segment ii except base, cuneus, and basal one-third or more of corium, pale.

Male: Length 3.5 mm., width 1.5 mm. Head: Width .71 mm., vertex .36 mm.; blackish, base of vertex slightly paler. Rostrum, length 1.33 mm., reaching upon the hind coxae.

Antennae: Segment i, length .28 mm., black; ii, 1 mm., pale, black at base; iii, .70 mm., pale; iv, .47 mm., pale.

Pronotum: Length .57 mm., width at base 1.11 mm.; black, moderately shining, clothed with pale yellowish pubescence. Scutellum black, sometimes with pale spot on each basal angle; sternum black, lower margin of propleura pale; ostiolar peritreme pale but becoming dusky about the ostiole and above.

Hemelytra: Embolar margins moderately arcuate; black, basal one-third of embolium and corium, and to some extent invading the clavus, pale; anal ridge and sometimes apex of embolium pale; cuneus pale, in darkest specimens becoming dusky; clothed with pale yellowish pubescence. Membrane uniformly fuscous, veins and bordering cuneus pale.

Legs: Black, apices of coxae, bases and narrow tips of femora, pale; tibiae pale, knees, spines and spot at base of each, black, spots absent or much reduced on apical one-third. Venter black, moderately shining.

Female: Length 3.4 mm., width 1.61 mm.; very similar to the male but slightly more robust; frequently the pronotal disk with pale spot on middle, sides of venter becoming more or less pale.

Holotype: Male, 27 July, 1916, McLean, N. Y. (H. H. Knight); author's collection. *Allotype*: same data as type. *Paratypes*: Males and females (24), taken with types on meadow-sweet (*Spiraea salicifolia*). COLORADO—Female, 1 Aug., 1898, Fort Collins (E. D. Ball). MAINE—Male, 10 July, 1909, Calais (C. W. Johnson). Male, 15 July, 1914, Monmouth (C. A. Frost). MINNESOTA—Female, 2 July, 1920, Hennepin County (H. H. Knight). NORTH DAKOTA—Female, 24 July, 1920, Nelson County (T. H. Hubbell). NEW YORK—Males and females (8), 4 July, males and females (5), 12 July, females (3), 28 July, males and females (6), 29 July, 1913, Batavia (H. H. Knight); specimens taken on the last two dates were found on squash vines. RHODE ISLAND—Female, 3 July, 1910, Cumberland.

P. albonotatus var. **tinctus** Knight, new variety.

Very similar to the typical species except that the pale areas are tinged with reddish; cuneus distinctly red; legs yellow to reddish, femora with two rows of prominent black spots on anterior face, the posterior face also spotted with black.

Holotype: Male, 20 June, 1920, Harrisburg, Pa. (A. B. Champlain); author's collection. *Paratypes*: Males (2) and females (2), taken with

type. MARYLAND—Female, 7 June, 1914, Plummer's Island (W. L. McAtee). NORTH CAROLINA—Female, Hot Springs (A. T. Slosson). PENNSYLVANIA—Female, Greensburg (Wirtner). Male, 5 June, 1907, Pennsylvania Station.

P. albonotatus var. **compar** Knight, new variety.

Apparently only a color form of *albonotatus* but more broadly pale, thus requiring accommodation in a different section of the key.

Color pattern suggestive of *albatus* but smaller and more ovate in form. Distinguished from typical *albonotatus* by the pale scutellum which is dark only on median line; pronotal disk broadly pale on central area and between calli.

Holotype: Male, 10 Aug., 1916, Batavia, N. Y. (H. H. Knight); author's collection. Paratypes: NEW YORK—Females (2), 12 July, female, 29 July, 1914, male, 26 July, 1915, Batavia; female, 27 July, 1916, McLean (H. H. Knight). MAINE—Female, 27 Aug., 1917, Paris (C. A. Frost).

P. obscurus Uhler.

Hayden's Surv. Terr. for 1871, 418, 1872.

Female: Length 4.4 mm., width 1.69 mm.; larger and more elongate than *albonotatus*, moderately shining, clothed with pale yellowish pubescence; rostrum scarcely attaining hind margins of posterior coxae, yellowish, basal segment blackish; antennae fuscous to black, segment i pale at extreme apex, segments iii and iv dusky; pronotum blackish, calli and central area of disk pale; scutellum black, lateral margins more or less pale, and rarely, if ever, does the pale color replace the black on apex of median line; sternum, pleura, and ostiolar peritreme black; hemelytra nearly as in *albonotatus*, but cuneus pale and apex distinctly blackish; legs pale to yellowish, base of hind coxae, apical half of femora with line forming on dorsal margin, and beneath this line one or two rows of spots, knees, and spots at base of spines, black or blackish; venter blackish, becoming more or less pale on the sides.

Colorado, Maine, New Hampshire, New York, Vermont, Quebec, Nova Scotia.

***P. obscurus** var. **albocuneatus** Knight, new variety.

Very similar to the typical *obscurus* but the cuneus uniformly pale or yellowish; sometimes more broadly pale above but not ordinarily.

Holotype: Male, 26 July, 1916, Batavia, N. Y. (H. H. Knight); author's collection. Paratypes: a large series from the type locality. CONNECTICUT—Male, 18 July, 1921, Cornwall (B. H. Walden). Male, 9 July, 1920, Huntington; male, 22 July, 1920, Litchfield (P. Garman). Male, 27 June, 1914, females (2), 4 July, males (2), 5 July, 1920, New Haven (B. H. Walden). MASSACHUSETTS—Male, 3 Aug., 1907, Mt. Greylock (C. W. Johnson). Female, 4 Sept., 1919, Mt. Greylock (H. M. Parshley). NEW HAMPSHIRE—Females (2), 24 July, 1915, Glenhouse (C. W. Johnson). NEW YORK—Males (3) and females (4), 4 July, 1919, Cold Spring Harbor, Long Island; female, 25 July, 1919, Babylon, Long Island (H. M. Parshley). VERMONT—Male, 15 June, 1908, Brattleboro (C. W. Johnson).

P. fraternus Uhler.

Uhler, Hemip. Colo., 5i, 1895.

Of all the material examined, the writer has found not more than three specimens which fit the original description as regards color of scutellum and pronotum. Where the pronotum agrees with *fraternus* the scutellum is likewise pale, thereby referring the specimen to *obscurus*; specimens having a black scutellum rarely have the pronotum pale as described for *fraternus*. For the present, the writer designates as *fraternus* those specimens having a black scutellum even though the pronotum may likewise be black, other characters as indicated in the key.

Judging by the large amount of material thus far examined, from Colorado as well as the eastern states, *fraternus* Uhler appears to be nothing more than a variety of *obscurus* Uhler.

Guilford, 13 July, 1920 (B. H. W.); Huntington, 9 July, 1920 (B. H. W.); New Haven, 4 July, 1920 (B. H. W.).

***Plagiognathus alboradialis** Knight, new species.

Larger than *obscurus*, distinguished readily by the pale color pattern of the hemelytra.

Male: Length 5 mm., width 1.66 mm. Head: Width .78 mm., vertex .38 mm.; black, slightly paler at base of vertex. Rostrum, length 1.83 mm., yellowish, basal segment blackish except apically.

Antennae: Segment i, length .38 mm., black, narrowly pale at apex; ii, 1.58 mm., black; iii, .97 mm., pale fuscous; iv, .51 mm., pale fuscous.

Pronotum: Length .74 mm., width at base 1.33 mm.; black, moderately shining, central area of disk sometimes slightly paler. Scutellum black, brownish at basal angles, more rarely yellowish with median line black; sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins nearly straight; black, corium and embolium pale at base, corium with pale area finding its distal limit along the radial vein, usually reaching to near middle; embolium usually slenderly pale for its entire length; cuneus uniformly pale translucent; moderately clothed with pale yellowish pubescence. Membrane uniformly fuscous, spot bordering cuneus, and the apex of brachium, pale.

Legs: Nearly as in *obscurus*; hind femora with two very distinct rows of black spots on anterior face, not dusky beneath, and scarcely forming a dark line above. Venter black, moderately shining, very finely pale pubescent.

Female: Length 4.5 mm., width 1.66 mm.; more robust and more broadly pale than the male; pronotal disk broadly pale; scutellum with lateral margins basally, pale; corium with fuscous area on apical half divided into two spots by the pale color which extends along radius to join that of cuneus.

Holotype: Male, 25 June, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (24), taken with the types. CONNECTICUT—Male, 17 July, 1909, Middletown (C. W. Johnson). MAINE—Female, 10 July, 1907, Calais; Male, 20 July, 1907, Capens; male and females (3), 15 July, 1909, Eastport; Male, 26 July, 1906, Males (7) and females (4), 22 July, 1909, Machias; Males and females, 12 July, 1909, Princeton; male, 27 July, 1910, Traveller Mountain (C. W. Johnson). NEW HAMPSHIRE—Male, Mt. Washington (Mrs. A. T. Slosson). Males (2) and females (3), 15 July, male and females (2), 24 July, 1915, Glen House; male and female, July, 1913 (alt. 3000 ft.), female, 15 July, female, 28 July, 1915, Mt. Washington; male, 18 July, 1915, Halfway House, Mt. Washington (C. W. Johnson). NEW YORK—Females (2), 4 July, 1915, Four Mile; Female, 26 July, 1916, Ithaca; Females (4), 22 Aug., 1916, Whiteface Mountain (H. H. Knight). VERMONT—Male and females (2), 26 June, 1906, Montpelier (C. W. Johnson). ONTARIO—Females (3), 10 July, 1915, Parry Sound (H. S. Parish).

Plagiognathus flavoscutellatus Knight, new species.

Male: Length 4.4 mm., width 1.67 mm. Head: Width .80 mm., vertex .36 mm.; black, vertex and front more or less yellowish. Rostrum, length 1.57 mm., reaching to middle of hind coxae, black.

Antennae: Segment i, length .31 mm., black, narrowly pale at apex; ii, 1.43 mm., black, cylindrical, slightly thinner than segment i; iii, .88 mm., brownish black; iv, mutilated.

Pronotum: Length .68 mm., width at base 1.29 mm.; black, moderately shining, pale pubescent. Scutellum black, becoming pale at apex and along median line, sometimes only the basal angles remaining dark. Sternum and pleura black, ostiolar peritreme somewhat yellowish.

Hemelytra: Embolar margin very slightly arcuate; black, basal half of embolium and corium, apex of embolium, base and outer margin of cuneus, pale to yellow, pale color on corium finding its distal limit along radial vein rather than along claval suture. Membrane uniformly fuscous, a clear spot bordering apex of cuneus, veins pale or yellowish.

Legs: Fulvous to dark brown, femora with two rows of black spots on anterior face, irregularly spotted on posterior face; coxae blackish except apically; knees black, tibiae with prominent black spines, black spots at base of spines becoming obsolete apically. Venter black, moderately shining, pale pubescent; genital characters distinctive.

Female: Length 4.3 mm., width 1.7 mm.; more robust than the male, usually more broadly pale; scutellum except base, just before calli and a slight vitta on median line at base of pronotal disk, pale; embolium, claval suture, anal ridge and joining with base of cuneus, pale; dark color of cuneus reduced to a blackish spot bordering smaller areole; legs more fulvous than in the male.

Food plant: *Salix longifolia*.

Holotype: Male, 6 Aug., 1914, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: 12 July, 1919, Hennepin County, Minnesota (H. H.

Knight). Paratypes: MICHIGAN—Male, 13 July, 1920, Berrien County (R. F. Hussey). MINNESOTA—Males (4) and females (3), 18 July, 1922, Ramsey County (H. H. Knight), on *Salix longifolia*. OHIO—Females (3), 9 June, 1915, Columbus (C. J. Drake). Female, 24 June, 1921, Columbus (A. E. Miller). PENNSYLVANIA—Female, 13 July, 1918, Williamsport (J. G. Sanders). VERMONT—Females (2), 8 July, 1908, Norwich (C. W. Johnson). NOVA SCOTIA—Female, 2 Aug., 1917, Truro (W. H. Brittain). QUEBEC—Male and female, 19 July, 1914, Hull (J. I. Beaulne).

**P. brevirostris* Knight, new species.

General aspect very similar to variety *albocuneatus* but larger, more elongate, cuneus usually tinged with fulvous; distinguished by the short rostrum which does not attain hind margins of middle coxae.

Male: Length 4.6 mm., width 1.8 mm. Head: Width .79 mm., vertex .37 mm.; black, vertex pale. Rostrum, length 1.36 mm., reaching upon middle of intermediate coxae, black.

Antennae: Segment i, length .35 mm., black; ii, 1.43 mm., black, cylindrical, more slender than segment i; iii, 1 mm., dark fuscous; iv, .54 mm., fuscous.

Pronotum: Length .63 mm., width at base 1.26 mm.; black, clothed with prominent pale yellowish pubescence. Scutellum black, minutely transversely rugulose, yellowish pubescent. Sternum and pleura black; ostiolar peritreme black, posterior margin somewhat yellowish.

Hemelytra: Embolar margin slightly arcuate, widest near the cuneus; black, moderately shining, embolium and basal half of corium pale, dark color frequently invading apical half of embolium, sometimes pale color extending along claval suture to anal ridge; cuneus pale, usually tinged with fulvous, apex sometimes dusky or pale fuscous; clothed with prominent yellowish pubescence. Membrane uniformly fuscous, pale bordering apex of cuneus; veins pale or fulvous.

Legs: Black, apices of coxae and femora, trochanters, and frequently rather broadly at base of femora, pale; tibiae pale, knees, spines and spots at base, black. Venter black, moderately shining, pale pubescent; genital structures distinctive of the species.

Female: Length 4 mm., width 1.89 mm.; shorter and more robust than the male; pale color along claval suture spreading to involve outer margin of clavus; legs more broadly pale.

Holotype: Male, 1 July, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: CONNECTICUT—Male, 22 July, 1920, Litchfield (P. Garman). MAINE—males (2) and females (2), 26 July, 1909, Machias (C. W. Johnson). MICHIGAN—Male, 28 June, 1920, Washtenaw County (R. F. Hussey). NEW HAMPSHIRE—Males (2) and female, 15 July, 1915, Glen House (C. W. Johnson). VERMONT—Female, 8 July, 1908 (C. W. Johnson). NEWFOUNDLAND—Males (4) and females (2), 9 Aug., Spruce Brook (G. P. Englehardt).

**P. nigritus* Knight, new species.

Black; distinguished by the short rostrum.

Male: Length 4.4 mm., width 1.6 mm. Head: Width .51 mm.,

vertex .37 mm.; black, vertex yellowish. Rostrum, length 1.26 mm., only reaching to middle of intermediate coxae, black, yellowish on third segment.

Antennae: Segment i, length .34 mm.; ii, 1.27 mm., cylindrical, not equal to thickness of segment i, clothed with fine dusky pubescence; iii, .59 mm., black; iv, mutilated; all the segments black.

Pronotum: Length .67 mm., width at base 1.31 mm.; black, shining, clothed with yellowish pubescence. Scutellum and mesoscutum black; sternum and pleura black, lower margin of epimeron and ostiolar peritreme, pale.

Hemelytra: Embolar margin only very slightly arcuate; black, shining, cuneus uniformly black like the corium. Membrane uniformly dark fuscous, scarcely paler bordering apex of cuneus, veins brownish.

Legs: Black, femora yellowish at apex, anterior pairs more broadly yellowish on posterior face; tibiae yellowish, spines and large spots at base black; tarsi blackish, first two segments brownish. Venter black, shining, yellowish pubescent; genital structures distinctive of the species.

Holotype: Male, 11 July, 1905, Thompson, Conn. (H. L. Viereck); author's collection. A specimen is at hand, male, 8 Aug., 1898, Fort Collins, Col. (E. D. Ball), which the writer is unable to separate from this species.

P. annulatus Uhler.

Uhler, Hemip. Colo., 51, 1895.

Male: Length 4.2 mm., width 1.5 mm.; brownish black, rather slender, shining; pubescence golden yellow; legs pale to yellowish, basal half of coxae, apical tarsal segment and the claws, spots and spines on tibiae, knees, a dorsal and ventral line and four or five spots on anterior face of femora, black; femora sometimes shaded with brownish; antennal segments iii and iv, rostrum except basal segment and extreme apex, basal carina of vertex, and sometimes front margin of pronotum, yellowish to brown or darker.

Female: Length 4.2 mm., width 1.6 mm.; very similar to the male but slightly more robust.

Originally described from a single female specimen from Colorado.

Allotype: Male, 16 July, 1909, Denver, Col. (W. J. Gerhard); author's collection.

Huntington, 9 July, 1920 (B. H. W.); New Haven, 4 July, 1905 (H. L. V.); 8 July, 1912 (B. H. W.), collected at light.

P. annulatus var. cuneatus Knight, new variety.

Smaller than *annulatus*, cuneus distinctly pale at base; femora yellowish, spotted with black but without forming black lines; pubescence yellowish to golden. This form may possibly represent a distinct species.

Male: Length 4 mm., width 1.5 mm. Head: width .75 mm., vertex .36 mm.; black, scarcely paler on vertex. Rostrum, length 1.61 mm., yellowish, basal segment blackish except apex, apical segment brownish toward apex.

Antennae: Segment i, length .30 mm., black, extreme tip pale; ii, 1.22 mm., black; iii, .83 mm., fuscous; iv, .47 mm., fuscous.

Pronotum: Length .61 mm., width at base 1.16 mm., brownish black. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Black, cuneus pale to yellowish at base; anal ridge pale; clothed with yellowish to golden pubescence. Membrane uniformly fuscous, veins pale, a small clear spot bordering apex of cuneus.

Legs: Pale to yellow, coxae fuscous at base; hind femora with two rows of small fuscous spots on anterior face, upper row near dorsal margin, the lower row less distinct and along median line; anterior femora with one row of small dots, hind pair somewhat dusky on anterior face; tibiae with small black spots at base, becoming obsolete toward apex. Venter uniformly black, finely pale pubescent.

Female: Length 4.2 mm., width 1.7 mm.; more robust but very similar to male in coloration.

Food plant: *Aster* sp.

Holotype: Male, 8 July, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: Female taken with types. NEW HAMPSHIRE—Female, 8 July, 1908, Hanover (C. W. Johnson). NEW YORK—Male, 29 July, 1915, Batavia; female, 26 July, 1916, Ithaca (H. H. Knight). VERMONT—Males (2), 8 July, 1908, Norwich; male, 23 July, 1912, Mt. Ascutney (C. W. Johnson).

P. annulatus var. *nigrofemoratus* Knight, new variety.

Similar to variety *cuneatus* but the femora black except on apices; cuneus black, fracture only very slightly translucent.

Holotype: Male, 8 July, 1920, Ithaca, N. Y. (H. H. Knight); author's collection.

***Plagiognathus nigrolineatus** Knight, new species.

Uniformly pale greenish, pale pubescent, distinguished by black lines on antennae and femora.

Male: Length 4.3 mm., width 1.58 mm. Head: width .75 mm., vertex .33 mm.; pale, apex of tylus black. Rostrum, length 1.5 mm., reaching to middle of hind coxae, pale, apex fuscous.

Antennae: Segment i, length .28 mm., pale, two longitudinal black lines on dorsal surface; ii, 1.38 mm., pale, a slender black line on anterior surface extending from base to near middle; iii, .69 mm., pale; iv, .31 mm., pale.

Pronotum: Length .64 mm., width at base 1.22 mm.; pale, somewhat greenish anteriorly.

Hemelytra: Embolar margin only very slightly arcuate; uniformly pale greenish translucent. Membrane and veins pale, streak on anal area bordering vein and spot in smaller areole, fuscous.

Legs: Pale; slender line on dorsal margin of femora, line on apical half of postero-ventral margin of hind femora, spot on knee, and a single dot on anterior face of hind femora at near

middle of apical half. black; tibiae pale, spines dusky but not dark at base. Venter pale greenish.

Female: Length 4.3 mm., width 1.66 mm.; similar to the male in coloration.

Food plant: *Quercus macrocarpa*.

Holotype: Male, 11 June, 1919, St. Paul, Minn. (H. H. Knight); Minn. Univ. Coll. Allotype: taken with type. Paratypes: Males and females (12), taken with types. CONNECTICUT—Female, 22 June, 1920, Orange (B. H. Walden). MINNESOTA—Males and females (28), 10 June, 1920, University Farm; males and females (6), 11 June, 1920, Anoka County (H. H. Knight), collected on *Quercus macrocarpa*. Males (5), females (9), 14 June, 1922, Lakeland (H. H. Knight).

P. chrysanthemi Wolff.

Miris chrysanthemi Wolff, Icones Cim., iv, 157, t, xv, f, 151, 1804.

Plagiognathus viridulus Reuter, Hem. Gymn. Eur., i, 74, 1878.

Male: Length 4.3 mm., width 1.5 mm.; pale greenish testaceous, disk of pronotum more nearly green, clothed with prominent black pubescence; base of antennal segments i and ii, and a subapical ring on segment i, black; femora with two rather distinct rows of black spots on anterior face; membrane pale fuscous, a darker spot just beyond apex of smaller areole.

Female: Length 3.8 mm., width 1.6 mm.; shorter and more robust than the male but very similar in coloration.

Food plant: *Chrysanthemum leucanthemum* Linnaeus.

Canada, Maine, New Hampshire, New York, Vermont.

P. blatchleyi Reuter.

Ofv. Finska Vet.-Soc. Forh., liv, Afd. A. No. 7, 61, 1912.

Male: Length 4.6 mm., width 1.7 mm.; pale greenish testaceous, clothed with pale yellowish pubescence, hairs becoming dusky on cuneus and apical half of corium and embolium; antennae black, segments iii and iv pale fuscous, extreme apex of segments i and ii pale; tylus black, basal and apical segments of rostrum blackish; legs nearly as in *chrysanthemi* but black spots on femora less conspicuous; membrane fuscous, central area of apical half, veins and invading membrane each side, paler.

Female: Length 4.4 mm., width 1.7 mm.; very similar to the male in coloration although the membrane, and sometimes antennae, slightly paler.

New York.

P. blatchleyi var. *nubilus* Knight, new variety.

Apparently only a color form of *blatchleyi* but distinctive in general aspect.

Male: Length 4.5 mm., width 1.8 mm.; yellowish green, head except tylus, and anterior half of pronotum, brighter green; basal half of pronotum, disk of clavus, and apical half of corium fuscous to blackish; sternum, pleura more or less, and venter, fuscous to blackish; legs greenish yellow and suffused with fuscous, spots as in typical form but with dark line forming above, also a shorter

but more distinct black line on lower margin of apical half; cuneus strongly yellowish, sometimes darker on its disk; membrane dark fuscous, veins yellowish, narrowly pale bordering veins, a clear spot by tip of cuneus.

Female: Length 4.2 mm., width 1.9 mm.; more ovate than the male but very similar in coloration; sometimes more broadly pale than male.

Holotype: Male, 26 July, 1916, Ithaca, N. Y. (H. H. Knight); author's collection. *Allotype*: same data as the type. *Paratypes*: Male taken with types. DISTRICT OF COLUMBIA—Females (2), 5 Sept., 1890, Washington (O. Heidemann). OHIO—Male, 17 Aug., Apple Grove; male, 23 Aug., 1915, Crown City (C. J. Drake). Females (2), 24 Aug., 1916, Springfield (W. S. Adkins). VIRGINIA—Male and females (3), 10 Aug., 1906, Great Falls (O. Heidemann).

P. albatus (Van Duzee).

Pomona Jour. Ent. Zool., vii, 116, 1915.

Length 4.2 mm., width 1.4 mm.; whitish, tylus, basal segment of antennae, more or less broadly on lateral margins of pronotal disk, inner half of clavus, subapical spot on corium or in darker specimens covering the apical half, sternum, and venter, black; calli and antennal segment ii frequently yellowish; membrane pale, a distinct fuscous ray along margin just beyond clear spot at tip of cuneus; hind femora with group of black spots on apical half, sometimes with a subdorsal row of spots extending upon basal half; tibiae with small and sometimes indistinct spots at base of spines; female more broadly pale than the male.

Food plant: Sycamore (*Platanus occidentalis*).

Guilford, 13 July, 1920 (B. H. W.); Orange, 22 June, 1920 (P. Garman).

***P. albatu**s var. *vittiscutis* Knight, new variety.

Apparently a color variety of *albatu*s although the writer has taken this form only on butternut (*Juglans cinerea*).

Color pattern very similar to *albatu*s but having the apical half of cuneus and median line of scutellum black.

Holotype: Male, 30 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. *Paratypes*: Males (3) and female, taken with types; male, 23 June, 1920, topotypic. CONNECTICUT—Female, 22 June, 1920, Orange (P. Garman). QUEBEC—Male, 10 July, 1920, Montreal (G. A. Moore).

***P. albatu**s var. *similis* Knight, new variety.

Suggestive of *albatu*s but distinguished by the black base of antennal segment ii, black juga and lora, two rows of spots on hind femora, and more prominent black spots on tibiae. This form may prove to be a good species but in the absence of more material and better characters, it seems best to place it as a variety of *albatu*s.

Female: Length 3.5 mm., width 1.5 mm.; ovate, robust, white and marked with black. Head: Width .63 mm., vertex .33 mm.; yellowish white, tylus and extending upon median line of front,

juga, lora, and lower margin of genae, black. Rostrum, length 1.39 mm., nearly attaining hind margins of posterior coxae, yellowish, basal segment and apex blackish.

Antennae: Segment i, length .25 mm., black, slender apex pale; ii, .86 mm., pale yellowish, basal one-fourth black; iii, .64 mm., pale; iv, .39 mm., pale.

Pronotum: Length .61 mm., width at base 1.16 mm.; black, central area of disk, inner angles of calli, and just before calli, pale or whitish; clothed with rather prominent pale yellowish pubescence. Scutellum pale, median line rather broadly, and the mesoscutum, black.

Hemelytra: Embolar margin moderately arcuate; white, inner half of clavus, apical half of corium and invading embolium, black; cuneus pale translucent, apical half infuscated, corium bordering base of cuneus pale; clothed with rather prominent, pale to yellowish pubescence. Membrane pale, veins white, smaller areole and spot bordering base of cuneus clear; apical half with broad fuscous ray just beyond clear spot at tip of cuneus; larger areole dusky.

Legs: Pale yellowish; hind femora with two rows of prominent black spots, anterior pairs with three or four spots forming a line; tibiae with prominent black spots at base of spines. Venter black, basal half of segments 4-8, pale.

Mr. Hussey collected the type on *Alnus incana*.

Holotype: Female, 5 July, 1920, New Buffalo, Berrien County, Mich. (R. F. Hussey); author's collection. Paratype: CONNECTICUT—Female, 7 July, 1920, New Haven (B. H. Walden).

Plagiognathus rosicola Knight, new species.

Fulvo-testaceous, antennae, tylus, sternum, and prominent spots on femora, black; length of antennal segment ii exceeding width of pronotum at base; rostrum reaching to middle of venter.

Male: Length 4.3 mm., width 1.64 mm. Head: Width .75 mm., vertex .33 mm.; fulvo-testaceous, tylus black, lora blackish apically. Rostrum, length 2.12 mm., reaching to near middle of venter, becoming blackish on basal segment and apex.

Antennae: Segment i, length .31 mm., black, apex narrowly pale; ii, 1.42 mm., black, base and the apex very slenderly pale; iii, 1.0 mm., fuscous; iv, .44 mm., fuscous.

Pronotum: Length .66 mm., width at base 1.22 mm.; fulvo-testaceous, lower pleural margin slightly paler. Scutellum very slightly darker than pronotum; sternum piceous, episternum except for dark spot above, and pleura, pale to fulvo-testaceous; ostiolar peritreme pale yellowish.

Hemelytra: Embolar margin nearly straight, widest just before cuneus; fulvo-testaceous to fusco-brownish, clothed with yellowish or golden pubescence; cuneus slightly darker on its disk. Membrane rather uniformly fuscous, a pale spot bordering apex of cuneus; veins fulvo-testaceous.

Legs: Pale to yellowish and tinged with brown, coxae fusco-

brownish on basal half; femora with two rows of very prominent black spots on anterior face, posterior face also spotted but the hind pair with only three or four subapical spots, postero-ventral margin with a black line on apical one-third; tibiae with large and prominent black spots at bases of spines. Venter fulvo-testaceous, genital segment and other segments beneath, becoming dark brownish black; moderately shining, rather finely yellowish pubescent.

Female: Length 4.4 mm., width 1.7 mm.; more robust than the male but very similar in coloration.

Holotype: Male, 30 June, 1905, Plummer's Island, Md. (O. Heidemann); Cornell University Collection. Allotype: taken with type. Paratypes: ILLINOIS—Males (3), 14 June, 1911, Pinkstaff (C. A. Hart), collected "on roses." MARYLAND—Males (6) and females (2), taken with types. Male, 5 July, 1905, Great Falls (O. Heidemann), collected "on wild roses." MISSOURI—Male, 12 June, Kansas City (F. Rogers).

**P. fulvidus* Knight, new species.

Fulvo-testaceous, antennae, lower half of head, and under surface of body, black; antennal segment ii not equaling width of pronotum at base; rostrum scarcely attaining hind margins of posterior coxae.

Male: Length 3.9 mm., width 1.4 mm. Head: Width .66 mm., vertex .36 mm.; fulvo-testaceous, eyes and lower half of head black, lower margin of bucculae, brownish. Rostrum, length 1.5 mm., reaching to near hind margins of posterior coxae, yellowish, apex blackish.

Antennae: Segment i, length .25 mm., black, apex very slenderly pale; ii, 1 mm., black; iii, .64 mm., pale fuscous, black at base; iv, .39 mm., fuscous.

Pronotum: Length .67 mm., width at base 1.22 mm.; fulvo-testaceous, lower half of pleura and the xyphus black. Scutellum fulvo-testaceous. Sternum, pleura, and ostiolar peritreme, black but with a tinge of reddish.

Hemelytra: Embolar margins very slightly arcuate; fulvo-testaceous, disk of corium and apically on corium frequently darkened with fuscous; cuneus slightly paler than corium; clothed like the whole dorsum with moderately fine, golden pubescence. Membrane uniformly fuscous, a narrow pale spot bordering apex of cuneus; veins yellowish.

Legs: Yellowish to fulvo-testaceous, hind coxae darkened with fuscous on basal half; hind femora with two rows of fuscous spots on anterior face, the lower row sometimes nearly obsolete; knees black, spots at base of tibial spines rather small. Venter black, sometimes with a tinge of reddish.

Female: Length 3.5 mm., width 1.5 mm.; slightly more robust but very similar to the male in coloration.

Holotype: Male, 30 July, 1910, East River, Conn. (C. R. Ely); author's collection. Allotype: taken with type. Paratypes: CONNECTICUT—Male

and female, 24 July, 1910, Hamden (B. H. Walden). NEW JERSEY—Female, 19 July, 1908, Ramsey (Wm. T. Davis). NORTH CAROLINA—Female, 20 July, Tryon (W. F. Fiske), collected at light.

P. delicatus (Uhler).

Ent. Amer., iii, 34, 1887.

Length 3.3 mm., width 1.4 mm.; reddish yellow to brownish, antennal segment i except extreme tip, and a ring at base of segment ii, dark fuscous; front of head more or less dark each side of median line; hemelytra, sternum, and abdomen, shaded with fuscous, sometimes the basal margins of calli quite dark; scutellum yellowish, usually with basal angles dark and thus leaving median line pale; membrane lightly shaded with fuscous, an area near middle and spot each side adjacent to apex of cuneus, clear; legs pale yellowish to fulvous, two rows of spots on femora, tibial spines and spots at base, apices of tarsi and claws, black.

Occurs on honey locust (*Gleditsia triacanthos*).

New York.

Plagiognathus caryae Knight, new species.

Male: Length 3.9 mm., width 1.44 mm. Head: Width .72 mm., vertex .31 mm.; yellowish to fulvous, tylus and lower half of face blackish. Rostrum, length 1.28 mm., just attaining hind margins of middle coxae, yellowish, basal and apical segments becoming blackish.

Antennae: Segment i, length .23 mm., black, extreme apex pale; ii, 1.02 mm., yellowish, black annulus at base, the apex becoming dusky; iii, .61 mm., pale yellowish and becoming dusky; iv, .36 mm., like the preceding.

Pronotum: Length .61 mm., width at base 1.19 mm.; dark brownish black, central area of disk, and calli more or less, yellowish to fulvous. Scutellum yellowish to fulvous, median line rather broadly, and the mesoscutum, brownish black. Sternum and pleura blackish, ostiolar peritreme only slightly paler.

Hemelytra: Embolus margins nearly straight; brownish black, more or less broadly each side of claval vein, bordering radial vein from base to apex, basal margin and inner angle of cuneus, anal ridge, and usually basal half of embolus, yellowish translucent to fulvous; clothed with rather fine, pale golden pubescence. Membrane fuscous, sometimes slightly paler on middle, small spot adjacent to apex of cuneus clear, veins yellowish.

Legs: Pale yellowish and tinged with dusky; femora with two rows of black spots on anterior face, larger and darker on hind pair; tibial spines with black spots at base but becoming obsolete near apices. Venter black, very finely yellowish pubescent.

Female: Length 3.4 mm., width 1.53 mm.; more robust than the male, very similar in coloration but frequently the pronotum more broadly pale.

Holotype: Male, 22 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and

females (21), taken with the types on *Carya cordiformis*. NEW YORK—Female, 30 June, 1914, males and females (15), 18 June, 1915, Batavia; males and females (8), 23 June, 1920, Ithaca; male, 27 June, 1915, Portageville (H. H. Knight). MISSISSIPPI—Male, 4 May, males and females (12), 27 May, 1915, Agricultural College (C. C. Greer), collected on pecan (*Carya illinoensis*).

P. repletus Knight, new species.

Suggestive of *albatus* variety *vittiscutis* but having the rostrum distinctly shorter.

Female: Length 3.9 mm., width 1.4 mm. Head: Width .57 mm., vertex .36 mm.; black, somewhat paler on vertex, pale pubescent. Rostrum, length 1.35 mm., scarcely attaining hind margins of middle coxae, yellowish brown, basal segment and apex blackish.

Antennae: Segment i, length .27 mm., black, narrow apex yellowish; ii, 1.46 mm., slender, slightly thicker toward apex, yellowish, basal one-fourth blackish, finely pale pubescent; iii, .67 mm., yellowish, fuscous at base; iv, .37 mm., yellowish to dusky.

Pronotum: Length .60 mm., width at base 1.21 mm.; black, central area of disk, between calli and just before on anterior margin, pale yellowish; clothed only with simple slender, yellowish pubescent hairs. Scutellum yellowish, median line black, mesoscutum rather broadly exposed, blackish, yellowish pubescent. Sternum and pleura black, ostiolar peritreme blackish but with a yellow tinge.

Hemelytra: Embolar margin only very slightly arcuate; black, margins of clavus and corium bordering claval suture, basal one-third of corium, embolium, cuneus, anal ridge and extending along apex of corium to join cuneus, yellowish translucent; embolium somewhat dusky bordering black area of corium; moderately shining, yellowish pubescent. Membrane uniformly fuscous, a narrow clear spot bordering apex of cuneus, veins pale yellowish.

Legs: pale yellowish, hind coxae dark fuscous on basal half; hind femora becoming brownish on apical half except apex, two rows of black spots on anterior face, showing through the obscuration; anterior and middle femora showing only three or four fuscous points; tibiae yellowish, knees, spines and spots at base, black, tarsi fuscous. Venter black, or brownish black, yellowish pubescent.

Holotype: Female, 25 June, 1914, Batavia, N. Y. (H. H. Knight); author's collection.

***P. repletus** var. *apicatus* Knight, new variety.

Similar in structure to the typical *repletus* but differing in certain color aspects; cuneus black, pale only at base; black color of corium spread to include inner apical angles, also apical half of embolium darkened; antennae and legs not darker than in the typical species.

Holotype: Female, 16 July, 1916, Conesus Lake, N. Y. (H. H. Knight); author's collection. Paratype: Female, 7 July, 1920, New Haven, Conn. (B. H. Walden).

Plagiognathus cornicola Knight, new species.

General coloration fusco-brownish or liginous, calli darker; antennal segment ii fusco-brownish, blackish at base.

Male: Length 3.4 mm., width 1.24 mm. Head: Width .69 mm., vertex .32 mm.; brownish, lower half of face, and sometimes the front, more or less blackish. Rostrum, length 1 mm., fusco-brownish.

Antennae: Segment i, length .19 mm., black, extreme tip pale; ii, .78 mm., fusco-brownish to fuscous, blackish at base; iii, .52 mm., fusco-brownish; iv, .33 mm., pale fuscous.

Pronotum: Length .55 mm., width at base 1.12 mm.; brownish to fusco-brownish, calli darker. Scutellum uniformly fusco-brownish. Sternum and pleura brownish to blackish; ostiolar peritreme pale brownish.

Hemelytra: Embolar margin very slightly arcuate; fusco-brownish or liginous, somewhat translucent; cuneus evenly colored like the corium; clothed with very fine pale yellowish pubescence. Membrane fuscous, veins paler, a small clear spot bordering apex of cuneus.

Legs: Fusco-brownish to blackish, apices of femora pale; tibial spines with rather prominent black spots at base. Venter brownish black to black.

Female: Length 3 mm., width 1.33 mm.; slightly more robust than the male but very similar in coloration.

Holotype: Male, 4 July, 1914, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (32), taken with the types on *Cornus*. MASSACHUSETTS—Males and females (10), 13 July, from *Cornus amomum*, male and female, 14 July, 1921, Arnold Arboretum, Boston (Harold Morrison). NEW YORK—Female, 27 July, 1915, Batavia (H. H. Knight). VIRGINIA—Female, 27 June, 1915, Mount Vernon (W. L. McAtee), taken on *Cornus stricta*.

P. punctatipes Knight, new species.

Black, antennal segment ii pale but black at base; legs yellowish, hind femora with two rows of black spots on anterior face.

Male: Length 3.8 mm., width 1.7 mm. Head: Width .72 mm., vertex .37 mm.; black, vertex slightly pale. Rostrum, length 1.39 mm., reaching to middle of hind coxae; blackish, paler on middle segments.

Antennae: Segment i, length .25 mm., black; ii, .97 mm., pale to yellowish, blackish at base; iii, .66 mm., pale yellowish; iv, .39 mm., pale to dusky.

Pronotum: Length .67 mm., width at base 1.28 mm.; black, shining, slightly pale at lower pleural margin. Scutellum, sternum, and pleura, black; ostiolar peritreme blackish, pale indications around margins.

Hemelytra: Embolar margins very slightly arcuate; black, moderately shining, clothed with pale yellowish pubescence; cuneus uniformly black, scarcely translucent at base. Membrane uniformly fuscous, veins and margin bordering tip of cuneus slightly paler.

Legs: Pale yellowish to fulvous; coxae dull fuscous, paler at apices; hind femora with two rows of prominent black spots on anterior face; tibial spines with rather small black spots at base, becoming obsolete near apex. Venter black, moderately shining, very finely pale pubescent.

Female: Length 3.7 mm., width 1.7 mm.; slightly more robust than the male but very similar in coloration.

Holotype: Male, 23 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (16), taken with types; collected on flowers of an ornamental shrub. PENNSYLVANIA—Male, 7 June, 1919, North Bloomfield (T. L. Guyton).

**P. punctatipes* var. *dispar* Knight, new variety.

Smaller and more slender than *punctatipes*, very similar in coloration but with cuneus narrowly pale at base.

Male: Length 3.5 mm., width 1.28 mm. Head: Width .67 mm., vertex .31 mm.; black, vertex yellowish. Rostrum, length 1.24 mm., reaching to middle of hind coxae, yellow, basal segment and apex blackish.

Antennae: Segment i, length .22 mm., black, narrow apex pale; ii, .90 mm., yellow, narrowly blackish at base; iii, .58 mm.; iv, .36 mm.; last two segments yellowish.

Pronotum: Length .53 mm., width at base 1.06 mm.; black, moderately shining, yellowish pubescent. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Black, base of cuneus yellowish translucent. Membrane pale fuscous, central area and a spot bordering apex of cuneus paler, veins yellowish to dusky.

Legs: Pale to yellow, hind coxae except apex, fuscous; hind femora with twelve fuscous spots forming two rows on anterior face, a group of five or six spots on posterior surface near apex; tibiae with very small fuscous spots at base of spines. Venter black, moderately shining, finely pale yellowish pubescent.

Female: Length 3.3 mm., width 1.39 mm.; slightly more robust than the male but very similar in coloration.

Holotype: Male, 14 July, 1916, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (2) and females (6), taken with the types on hickory (*Carya*). CONNECTICUT—Male, 8 July, 1912, New Haven, collected at light. ILLINOIS—Male, 31 May, 1914, Dixon (C. A. Hart). MICHIGAN—Female, 3 July, 1920, Berrien County (R. F. Hussey). NEW YORK—Female, 24 June, female, 5 July, 1914, male, 24 June, 1915, males (2), 31 July, 1916, Batavia; males (2) and females (4), 16 July, 1916, Conesus Lake (H. H. Knight).

Plagiognathus davis Knight, new species.

Dorsum black, clothed with erect, rather sparsely set, yellowish pubescence.

Female: Length 3 mm., width 1.37 mm. Head: Width .66 mm., vertex .34 mm.; black, front strongly protruding before eyes, tylus prominent; clothed with prominent pale pubescence. Rostrum, length 1.49 mm., attaining hind margins of posterior coxae, yellowish, basal and apical segments blackish.

Antennae: Segment i, length .23 mm., yellowish, basal half and a spot with two bristles on dorsal surface of apical half, blackish; ii, .73 mm., yellowish, black on basal one-fifth, slightly thicker toward apex but not attaining thickness of segment i, clothed with prominent pale pubescence; iii, .41 mm., yellowish, dusky at base; iv, .38 mm., yellowish to dusky.

Pronotum: Length .57 mm., width at base 1.14 mm.; calli apparent by the sulcate margins, anterior margin of pronotal disk distinctly convex before calli; uniformly brownish black. Scutellum brownish black, distinctly sulcate and rugulose on middle; mesoscutum rather broadly exposed, clothed with a few prominent yellowish pubescent hairs, similar to those on scutellum. Sternum, pleura, and ostiolar peritreme, brownish black.

Hemelytra: Embolar margin only very slightly arcuate; uniformly dark brownish black, moderately shining, clothed with rather sparsely set, strongly erect, yellowish to dusky pubescent hairs. Membrane uniformly fusco-brownish, veins and narrow margin bordering apex of cuneus, paler; not extending beyond apex of abdomen.

Legs: Pale to yellowish, bases of coxae becoming fuscous; femora dusky pubescent, hind pair with a single subapical fuscous spot on lower margin of anterior aspect; anterior femora with a dusky line on dorsal margin before apex, also a slight indication on lower margin; tibial spines with small fuscous spot at base of each; tarsi yellowish, apical segment fuscous. Venter dark brownish black, clothed with yellowish pubescence.

Named in honor of the collector, Mr. Wm. T. Davis, who has discovered many new and interesting insects in the general vicinity of Staten Island and Long Island, N. Y.

Holotype: Female, 20 June, 1912, Pine Island, N. Y. (Wm. T. Davis); author's collection.

***P. laricicola** Knight, new species.

Black, legs fuscous but with small black spots showing through the obscuration; clothed with yellowish and dusky pubescence.

Male: Length 3.9 mm., width 1.39 mm. Head: Width .66 mm., vertex .33 mm.; black, vertex yellowish. Rostrum, length 1.28 mm., fuscous to black.

Antennae: Segment i, length .27 mm.; ii, 1.03 mm.; iii, .66 mm.; iv, .36 mm.; black, the last two segments more nearly fuscous.

Pronotum: Length .55 mm., width at base 1.11 mm.; black, scarcely shining. Scutellum black. Sternum, pleura, and ostiolar peritreme, dull black.

Hemelytra: Embolar margins very slightly arcuate; fuscous black, base of cuneus scarcely paler than corium; yellowish pubescent, hairs dusky on cuneus and to some extent on embolium. Membrane uniformly fuscous, veins pale, spot bordering apex of cuneus clear.

Legs: Dark fuscous, apices of femora slightly yellowish; small opaque black spots visible on anterior and posterior faces of femora; tibiae fuscous but black spots at bases of spines showing through the infuscation. Venter black, covered with an opaque bloom.

Female: Length 3.6 mm., width 1.55 mm.; more ovate and robust than the male but very similar in coloration.

Food plant: *Larix laricina*.

Holotype: Male, 27 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: Males and females (64), taken with the types on *Larix laricina*. CONNECTICUT—Male, 7 July, 1920, New Haven (B. H. Walden). MAINE—Female, 12 July, Princeton (C. W. Johnson). Male, 5 July, 1911, Orono. MINNESOTA—Males and females (36), 12 Aug., 1922, Beaver Dam, Cook County (H. H. Knight). NEW YORK—Males and females (18), 26 July, 1916, Ithaca (H. H. Knight). ALBERTA—Males (2) and females (3), 4 Aug., 1921, Nordegg (J. McDunnough).

***P. repetitus* Knight, new species.**

Smaller than *laricicola* but the dorsal aspect very similar; legs yellowish, femora with small, rather inconspicuous fuscous dots arranged in series on anterior face.

Male: Length 3 mm., width 1.24 mm. Head: Width .64 mm., vertex .33 mm.; black, shining, vertex scarcely paler. Rostrum, length .55 mm., yellowish, basal and apical segments blackish.

Antennae: Segment i, length .22 mm., black; ii, .75 mm., black; iii, .55 mm., fuscous; iv, .39 mm., pale fuscous.

Pronotum: Length .53 mm., width at base .97 mm.; black. Scutellum, sternum, pleura, and ostiolar peritreme black, moderately shining.

Hemelytra: Embolar margin only very slightly arcuate; black, moderately shining, clothed with fine yellowish pubescence; cuneus uniformly colored like the corium, not at all paler at fracture. Membrane and veins uniformly pale fuscous, scarcely paler bordering tip of cuneus.

Legs: Yellowish, coxae fuscous on basal half; femora spotted with fuscous, arranged in one or two rows on anterior face; tibiae with rather prominent black spots at bases of spines. Venter black, shining, minutely yellowish pubescent.

Female: Length 2.9 mm., width 1.16 mm.; very similar to the male in form and coloration.

Holotype: Male, 22 Aug., 1916, Whiteface Mountain, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (3) and females (4), taken with types. MASSACHUSETTS—Female, 5 July, 1914, Beach Bluff (H. M. Parshley). Female, 28 July, 1916, Pigeon Cove (C. E. Olsen). NEW JERSEY—Male, 15 June, 1908, Lakehurst (Wm. T. Davis). NEW YORK—Male, 22 July, 1920, Conifer (H. Osborn). Female, 12 Aug., 1920, Wanakena (C. J. Drake). NOVA SCOTIA—Male, 17 July, Truro (W. H. Brittain).

Plagiognathus suffuscipennis Knight, new species.

Color aspect suggestive of *Plesiodema pinetellum* (Zetterstedt) but tibiae with black spots at base of spines; antennal segment i and base of ii, black.

Male: Length 3.4 mm., width 1.3 mm. Head: Width .68 mm., vertex .36 mm.; black, moderately shining, scarcely paler on vertex. Rostrum, length 1.2 mm., reaching upon hind coxae, yellowish, base and apex becoming blackish.

Antennae: Segment i, length .23 mm., black, slenderly pale at apex; ii, .81 mm., yellowish tinged with fuscous, blackish at base, cylindrical, not equal to thickness of segment i; iii, .54 mm., yellowish; iv, .36 mm., yellowish.

Pronotum: Length .45 mm., width at base .98 mm.; dark brownish black; pubescence yellowish to dusky. Scutellum black, yellowish pubescent, minutely transversely rugulose; mesoscutum moderately exposed, black. Sternum, pleura, and ostiolar peritreme black.

Hemelytra: Embolar margins distinctly arcuate; uniformly brownish translucent, yellowish pubescent, slightly shining. Membrane uniformly pale fuscous, margins appearing slightly darker, veins yellowish brown.

Legs: Yellowish testaceous; coxae fuscous except apices; femora with two series of fuscous spots on anterior face, a group of six or eight spots on apical half of posterior face; tibiae yellowish, spot on knee, spines and small spot at base of each, blackish. Venter black, moderately shining, clothed with very fine pale yellowish pubescence.

Female: Length 3.2 mm., width 1.37 mm.; very similar to the male in coloration but in form more robust.

Food plant: *Picea mariana*.

Holotype: Male, 11 July, 1914, Rochester Junction, N. Y. (M. D. Leonard); author's collection. Allotype: same data as the type. Paratypes: Female, 11 July, female, 18 July, 1914, topotypic (M. D. Leonard), collected on spruce (*Picea*). MAINE—Male, 26 July, 1920, Peaks Island (G. A. Moore). MINNESOTA—Males and females (32), 12 Aug., 1922, Beaver Dam, Cook County (H. H. Knight), on *Picea mariana*.

Microphylellus Reuter.

Key to Species.

1. Hemelytra uniformly blackish 2
Hemelytra more or less pale; embolium, cuneus, and basal half of

- embolium pale or yellowish; scutellum pale but with median line blackish *maculipennis* n. sp.
 (a) Antennal segment ii and femora uniformly pale variety *maculipennis* typical
 (b) Antennal segment ii blackish, femora dotted with fuscous .. variety *fuscicornis* n. var. 5
2. Antennal segment ii pale, or fuscous only at base 3
 Antennal segment ii black, segment i pale on apical half *nigricornis* n. sp.
3. Antennal segment ii in length not equal to width of pronotum at base 4
 Antennal segment ii in length equal to or exceeding width of pronotum at base 6
4. Antennal segment i black, or chiefly black 5
 Antennal segment i yellowish, fuscous only at base; femora usually with fuscous dots on anterior face although at times obsolete; length 3.3 mm. *modestus*
5. Smaller, length 2.6-2.8 mm.; rostrum not extending beyond hind margins of middle coxae; femora uniformly yellowish, never with fuscous spots *tsugae* n. sp.
 Larger, length 3.3 mm.; rostrum nearly attaining hind margins of posterior coxae; femora with fuscous spots *tumidifrons* n. sp.
6. Rostrum long, extending beyond hind coxae, reaching to near middle of venter; hind femora uniformly pale yellowish .. *longirostris* n. sp.
 Rostrum shorter, reaching only to middle of hind coxae; hind femora with fuscous spots on anterior face *elongatus* n. sp.

M. modestus Reuter.

Ofv. Finska Vet.-Soc. Forh., liv, Afd. A. No. 7, 62, 1912.

Length 3.3-3.5 mm., width 1.3 mm.; liginous black, antennae and legs yellowish; antennal segment i fuscous at base, sometimes more broadly dark; hind femora usually with three or four fuscous dots on anterior face near dorsal margin although frequently obsolete; hemelytra uniformly blackish, membrane fuscous, scarcely paler bordering apex of cuneus, veins pale fuscous.

Occurs on elm (*Ulmus*) and white oak (*Quercus alba*). On elm the bugs are found most frequently among aphid curled leaves, feeding to some extent on honey dew. The writer has also observed this species to feed on eggs of the elm leaf beetle (*Galerucella luteola*).

Hamden, 20 June, 1920 (B. H. W.); New Haven, 27 June, 1913 (L. B. R.).

M. tumidifrons Knight, new species.

Distinguished from *modestus* by the more tumid front, and by the deep black color of antennal segment i.

Female: Length 3.2 mm., width 1.26 mm. Head: Width .68 mm., vertex .38 mm.; front distinctly tumid; black, pale pubescent, moderately shining. Rostrum, length 1.2 mm., nearly attaining hind margins of posterior coxae.

Antennae: Segment i, length .20 mm., black, scarcely paler at extreme tip; ii, .81 mm., yellow, dusky pubescent, slightly more slender toward base; iii, .54 mm., yellow; iv, .39 mm., yellowish to dusky.

Pronotum: Length .43 mm., width at base .88 mm.; black, moderately shining; a slight impression bordering front margin of calli; pale yellowish pubescent. Scutellum black; mesoscutum black, rather broadly exposed. Sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Black, slightly translucent, very similar to *modestus*. Membrane and veins uniformly pale fuscous, slightly paler bordering apex of cuneus.

Legs: Yellow, coxae black; femora with two rows of pale fuscous spots, dusky pubescent; apical tarsal segment fuscous. Venter black, scarcely shining, dusky pubescent.

Holotype: Female, 26 July, 1917, Truro, Nova Scotia (W. H. Brittain); author's collection.

Microphylellus tsugae Knight, new species.

Smaller than *modestus* but very similar in coloration; antennal segment i blackish; legs uniformly yellowish, black spots wanting.

Male: Length 2.8 mm., width 1.11 mm. Head: Width .56 mm., vertex .31 mm.; black, yellowish pubescent. Rostrum, length .86 mm., attaining hind margins of middle coxae, yellowish, darker at base and apex.

Antennae: Segment i, length .17 mm., fuscous black; ii, .66 mm., yellowish, sometimes fuscous at base; iii, .39 mm., pale; iv, .28 mm., dusky.

Pronotum: Length .39 mm., width at base .88 mm.; black, pale yellowish pubescent, moderately shining. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins scarcely arcuate; ligneous black, slightly translucent, moderately clothed with pale yellowish pubescence. Membrane uniformly fuscous, scarcely paler bordering apex of cuneus, veins slightly paler at apex of smaller areole.

Legs: Uniformly pale fuscous, bases of coxae and tips of tarsi darkened with fuscous. Venter uniformly fusco-blackish moderately shining.

Female: Length 2.7 mm., width 1.05 mm.; very similar to the male in form and coloration.

Food plant: Hemlock (*Tsuga canadensis*).

Holotype: Male, 3 July, 1920, McLean Bogs, Tompkins County, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (48), taken with types on *Tsuga canadensis*. Female, 7 July, 1920, Ithaca, N. Y. (H. H. Knight).

M. maculipennis Knight, new species.

Similar in size to *modestus* but distinguished by pale markings on dorsum.

Male: Length 3.4 mm., width 1.3 mm. Head: Width .69 mm., vertex .33 mm.; blackish, vertex pale. Rostrum, length 1.16 mm., attaining hind margins of middle coxae, yellowish, dark at base and apex.

Antennae: Segment i, length .30 mm., yellow, fuscous at base; ii, .86 mm., yellow, fuscous at base and dusky on apex; iii, .47 mm., yellowish and tinged with dusky; iv, .33 mm., pale fuscous.

Pronotum: Length .55 mm., width at base 1.11 mm.; blackish, moderately shining; central area of disk and the basal angles pale to yellowish; clothed with fine yellowish pubescence. Scutellum pale yellowish, median line rather broadly, and the mesoscutum, black. Sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins slightly arcuate; blackish, embolium, cuneus, and basal half of corium, pale to yellow, sometimes distinctly reddish; clothed with fine yellow pubescence, longest on base of clavus. Membrane fuscous, paler bordering apex of cuneus, veins pale only at apex of areoles.

Legs: pale to yellowish, basal half of hind coxae and tips of tarsi fuscous. Venter blackish, moderately shining.

Female: Length 3.4 mm., width 1.39 mm.; slightly more robust than the male but very similar in coloration.

Food plant: *Quercus alba*.

Holotype: Male, 11 June, 1919, University Farm, St. Paul, Minn. (H. H. Knight); Minn. Univ. Coll. Allotype: taken with the type. Paratypes: Males and females (12), taken with the types on *Quercus alba*. Males and females (8), 10 June, 1920, type locality (H. H. Knight). NEW YORK—Male, 25 June, 1915, Batavia; females (2), 23 June, 1916, Conesus Lake (H. H. Knight).

***M. maculipennis* var. *fuscicornis* Knight, new variety.**

Similar to the typical *maculipennis* but distinguished by the black antennal segments, segment i narrowly yellowish at apex.

Holotype: Male, 29 June, 1905, Monmouth, Maine (C. W. Johnson); author's collection.

***M. nigricornis* Knight, new species.**

Black, strongly shining, minutely pubescent; antennae yellow, segment ii and base of i, black; legs pale.

Male: Length 4 mm., width 1.44 mm. Head: width .66 mm., vertex .33 mm.; black, vertex slightly pale. Rostrum, length 1.22 mm., yellowish, basal segment and apex blackish.

Antennae: Segment i, length .25 mm., yellowish, black at base; ii, .94 mm., deep black, narrowly pale at base; iii, .69 mm., pale yellow; iv, .36 mm., pale yellowish.

Pronotum: Length .61 mm., width at base 1.11 mm.; black, minutely pale or dusky pubescent. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins nearly straight; uniformly black, strongly shining; dusky or black pubescent. Membrane and veins uniformly fuscous, not or scarcely paler bordering tip of cuneus.

Legs: Pale to yellowish; bases of coxae and tips of tarsi black-

ish, knees slightly dusky. Venter black, strongly shining, yellowish and black pubescent.

Female: Length 3.8 mm., width 1.3 mm.; very similar to the male.

Food plant: *Aster macrophyllus*.

Holotype: Male, 7 July, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (26), taken with the types on *Aster macrophyllus*. NEW YORK—Males (2), 20 June, 1915, Batavia; males (2), 5 July, 1915, Four Mile (H. H. Knight). Female, 5 Aug., 1920, Cranberry Lake (C. J. Drake). ONTARIO—Male, 27 July, 1915, Parry Sound (H. S. Parish).

Microphylellus elongatus Knight, new species.

About the size and form of *nigricornis* but with antennae yellow except base of segment i, larger and more elongate than *modestus*; antennal segment ii equal to width of pronotum at base.

Male: Length 4 mm., width 1.44 mm. Head: Width .68 mm., vertex .33 mm.; black, slightly paler at base of vertex. Rostrum, length 1.47 mm., yellowish, basal segment and apex blackish, reaching to middle of hind coxae.

Antennae: Segment i, length .28 mm., yellowish, fuscous at base; ii, 1.19 mm., yellow, sometimes slightly dusky at base; iii, .77 mm., yellowish; iv, .33 mm., yellowish.

Pronotum: Length .62 mm., width at base 1.16 mm.; black, pale to dusky pubescent. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins nearly straight; black, strongly shining; pale to dusky pubescent. Membrane nearly as in *nigricornis*.

Legs: Pale to yellow; bases of hind and middle coxae, and tips of tarsi, blackish; hind femora with a row of fuscous spots on anterior face near dorsal margin. Venter black, shining.

Female: Length 3.8 mm., width 1.4 mm.; very similar to the male.

Occurs on *Acer saccharum*.

Holotype: Male, 25 June, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Female, taken with types. Male and female, 1 July, 1915, type locality (H. H. Knight).

**M. longirostris* Knight, new species.

Very similar to *elongatus* but with rostrum distinctly longer, extending beyond hind coxae to near middle of venter.

Male: Length 3.8 mm., width 1.25 mm. Head: width .61 mm., vertex .32 mm.; black, slightly paler on vertex and bordering eyes. Rostrum, length 1.66 mm., reaching to middle of venter, yellowish, apex and basal segment except apically, blackish.

Antennae: Segment i, length .28 mm., fuscous at base; ii, 1.22 mm., yellow; iii, .86 mm., yellowish to dusky; iv, .44 mm., dusky.

Pronotum: Length .64 mm., width at base 1.11 mm.; black,

strongly shining, dusky pubescent. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins nearly straight; uniformly black, strongly shining; clothed with minute, dusky to black pubescence, longer and more prominent on cuneus and embolium. Membrane and veins uniformly fuscous, scarcely paler bordering apex of cuneus.

Legs: Pale to yellowish; base of hind coxae and apices of tarsi, fuscous; devoid of black spots. Venter black, strongly shining, clothed with yellowish and dusky pubescence.

Female: Length 3.9 mm., width 1.34 mm.; very similar to the male in form and coloration.

Food plant: Hazelnut (*Corylus americana*).

Holotype: Male, 2 July, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (2) and female, taken with types on hazelnut (*Corylus americana*). CONNECTICUT—Male, 7 July, 1920, New Haven (B. H. Walden). MASSACHUSETTS—Female, 11 July, 1907, Woburn. MINNESOTA—Females (4) 6 July, 1919, Anoka County; females (3), 20 July, 1920, Gray Cloud Island (H. H. Knight). Female, 11 July, 1920, Becker County; male, 10 July, 1920, Morrison County (A. A. Nichol). Males (4) females (6), 22 June, 1922, Kings Bluff, Winona County (H. H. Knight). NEW YORK—Female, 24 July, 1915, White Plains (J. R. Torre-Bueno).

Rhinocapsus Uhler.

Key to Species.

1. Antennal segment ii uniformly dark reddish or black 2
Antennal segment ii black apically, pale to reddish on basal one-third to one-half **vanduzeei**
2. Antennal segment ii in length, not or scarcely equal to width of pronotum at base; larger, length 4.3-4.6 mm. **rubricans**
Antennal segment ii in length distinctly greater than width of pronotum at base; smaller, length 3.4 mm. **miniatus** n. sp.

R. vanduzeei Uhler.

Trans. Md. Acad. Sci., i, 82, 1890.

Length 3.4 mm., width 1.4 mm.; fuscous to black; pronotum, vertex and bordering eyes, antennal segment i and basal half of ii, reddish orange; apical half of antennal segment ii black, somewhat incrassated; legs pale yellowish, femora with two rows of black dots on anterior face.

Food plant: Wild red raspberry (*Rubus idaeus*).

Brookfield, 27 July, 1910 (E. L. D.); New Haven, 4 July, 1921 (B. H. W.).

R. rubricans (Provancher).

Pet. Faune Ent. Can., iii, 154, 1887.

Length 4.2 mm., width 1.7 mm.; differs from *vanduzeei* by being slightly larger and more reddish, antennal segment ii entirely black and more distinctly incrassated.

MAINE—Male, 1 Aug., 1910, Penobscot County (Cushman). North Carolina, Canada.

R. miniatus Knight, new species.

Smaller than *rubricans* and more uniformly red; length of antennal segment ii distinctly greater than width of pronotum at base.

Male: Length 3.4 mm., width 1.36 mm. Head: Width .67 mm., vertex .31 mm.; red, becoming dark fuscous on tylus. Rostrum, length 1.28 mm., attaining middle of hind coxae, fusco-brownish.

Antennae: Segment i, length .25 mm., fusco-reddish; ii, 1.16 mm., uniformly dark fusco-reddish; iii, .72 mm., pale reddish to dusky; iv, .36 mm., dusky.

Pronotum: Length .50 mm., width at base 1.0 mm.; bright cinnabar red, shining. Scutellum scarcely darker than pronotal disk; sternum, pleura, and ostiolar peritreme, bright red.

Hemelytra: Embolar margin nearly straight; uniformly colored dragon's blood red; clothed with fine dusky pubescence. Membrane and veins uniformly pale fuscous, scarcely paler bordering apex of cuneus.

Legs: Reddish, tibiae pale to dusky and tinged with reddish, tips of tarsi darker. Venter rather uniformly fusco-reddish, shining, finely pale pubescent.

Holotype: Male, 28 June, 1908, Lakehurst, N. J. (Wm. T. Davis); author's collection.

Microsynamma Fieber.

M. bohemanii (Fallen).

Phytocoris bohemanii Fallen, Hemip. Suec., 106, 1829.

Saunders, Het. Brit. Isds., 319, 321, pl. 30, fig. 5, 1892.

Length 3.7 mm., width 1.5 mm.; pale, hemelytra, scutellum, pronotum, and femora, with fuscous shadings, a touch of reddish on pronotum and head; antennae except apex of segment i, vertex, tylus, head beneath, sides of thorax, and abdomen, black; finely pale yellowish pubescent.

Occurs on *Salix*.

New Jersey, New York. VERMONT—8 July, 1908, Norwich (C. W. Johnson).

Criocoris Fieber.

C. saliens (Reuter).

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 88, 1876.

Male: Length 2.7 mm., width 1.4 mm.; black, shining, clothed with white scale-like pubescence and intermixed with more erect pubescent hairs; antennal segments i and ii strongly incrassate, thickness of segment ii half as great as width of vertex.

Female: Length 3 mm., width 1.4 mm.; black, pubescence similar to that of male; antennae yellowish brown, segment i and

base of ii black, segment ii slender, scarcely more than half as thick as segment i.

New Jersey, New York.

Atractotomus Fieber.

A. magnicornis (Fallen).

Capsus magnicornis Fallen, Mon. Cim. Suec., 99, 1807.

Reuter, Hem. Gymn. Eur., i, 100, pl. vi, fig. 2, 1878.

Black, hemelytra tinged with fusco-reddish; clothed above with golden yellow, scale-like pubescence, more silvery on pleura, and intermixed with erect dusky pubescent hairs; length of antennal segment ii distinctly greater than width of head.

Female: Length 3.1 mm., width 1.44 mm. Head: Width .75 mm., vertex .35 mm. Rostrum, length 1.28 mm., attaining hind margins of posterior coxae. Antennae: Segment i, length .19 mm.; ii, .89 mm., thickness .12 mm., fusiform, black; iii, .50 mm., slender, pale; iv, .39 mm., pale to dusky. Pronotum: Length .54 mm., width at base 1.08 mm.

Hemelytra: Embolar margins moderately arcuate; fusco-blackish, very slightly tinged with reddish, slightly translucent. Membrane pale fuscous, scarcely paler bordering apex of cuneus, veins pale to yellowish. Legs: Fusco-brownish, tibiae dark fusco-brownish but with darker spots at base of spines.

Collected on *Pinus sylvestris* at Ithaca, N. Y.; specimens compared with European examples of *magnicornis* Fallen and found identical.

A. magnicornis var. *buenoi* Knight new variety.

Very similar to *magnicornis* but smaller and more ovate; length of antennal segment ii just equal to width of head.

Female: Length 2.5 mm., width 1.28 mm. Head: Width .72 mm., vertex .33 mm. Rostrum, length 1.16 mm., extending slightly beyond hind coxae.

Antennae: Segment i, length .18 mm.; ii, .72 mm., thickness .11 mm., fusiform, dark reddish brown to black; iii, .44 mm., pale to dusky; iv, .36 mm., pale to dusky.

Pronotum: Length .44 mm., width at base .97 mm.; thickly clothed with recumbent, yellowish sericeous pubescence, and intermixed with more erect dusky pubescent hairs; sericeous pubescence paler on pleura.

Hemelytra: Embolar margins slightly arcuate; fusco-blackish, not tinged with reddish as in *magnicornis*; pubescence a continuation of that on pronotum. Membrane uniformly fuscous, scarcely paler bordering cuneus, veins slightly testaceous.

Legs: Blackish, tibiae slightly paler, more dusky testaceous but with dark spots at base of spines. Venter uniformly blackish, dusky pubescent, sides with some pale sericeous, closely appressed pubescence.

Collected on hemlock and spruce by Mr. Bueno, for whom the species is named.

Holotype. Female, 29 June, 1919, White Plains, N. Y. (J. R. Torre-Bueno); author's collection. Paratypes: Females (2), taken with type.

Reuteroscopus Kirkaldy.

R. ornatus (Reuter).

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 90, 1876.

Length 3.4 mm., width 1.3 mm.; yellowish green, the pronotum with darker green; scutellum, clavus, membrane, and a bar across apex of corium, fuscous, the dark color forming a well-marked Greek cross.

Food plant: Ragweed (*Ambrosia*).

New Haven, 26 June, 1912, 28 Aug., 1910 (B. H. W.).

R. sulphureus (Reuter).

Ofv. Finska Vet.-Soc. Forh., xlix, No. 5, 23, 1907.

Psallus sulphureus Van Duzee, Cat. Hemip., p. 407, 1917.

Length 3.3 mm., width 1.18 mm.; yellow, sometimes with a greenish tinge; inner apical angles of corium, tip of clavus, anal area of membrane, and spot on inner angle of cuneus, fuscous; clothed with yellowish to fuscous pubescent hairs, base of each hair with a small fuscous spot, also sparsely set with small tufts of silvery scale-like hairs, arranged in series on median line and outer margins of head and pronotal disk, and present to some extent on clavus and corium; membrane conspurcate on a clear background, the fuscous color forming a short transverse bar touching margin just beyond tip of cuneus, clear each side of this but a second and larger fuscous area just before apex; femora thickly speckled with small pale fuscous spots.

The writer collected this species on ragweed (*Ambrosia*).

MISSOURI—15, July, 1915, Springfield; 22 July, 1915, Hollister. MASSACHUSETTS—Male, 22 Aug., 1912, Edgartown (C. W. Johnson).

Psallus Fieber.

Key to Species.

1. Femora pale, or pale with black spots but without black line on dorsal margin 2
 Femora blackish, or pale to yellowish and with spots but always having a dark line present on dorsal margin 3
2. Femora pale, tinged with red and spotted with black; dorsum chiefly red, head, pronotal disk, and scutellum, flecked with fuscous; cuneus red, narrowly pale at base; length 3.6 mm. (p. 468) *alnicola*
 Femora uniformly pale or yellowish; dorsum uniformly black; length 3.5 mm. (p. 467) *strobicola* n. sp.
3. Antennal segment ii not equal to three-fourths the width of pronotum at base 6
 Antennal segment ii in length, equal to more than three-fourths the width of pronotum at base 4

4. Scutellum black; cuneus always with blackish, frequently pale at base but pale areas of legs and hemelytra never tinged with fulvous 5
 Scutellum more or less pale on lateral margins, rarely entirely black; if scutellum black then cuneus pale or dusky only at apex; cuneus pale, sometimes slightly infuscated at apex but pale areas yellowish and tinged with fulvous (p. 466) *alnicenatus* n. sp.
5. Rostrum attaining hind margins of posterior coxae; hemelytra uniformly black; femora black; apices pale; length 3.6 mm. (p. 464) *morrisoni* n. sp.
 Rostrum scarcely surpassing hind margins of middle coxae; base of cuneus and usually tip of embolium and spot on base of corium, pale; length 4-4.6 mm. (p. 465) *parshleyi* n. sp.
 (a) Femora pale, dark line forming on dorsal margin, anterior face with black spots and at times becoming dusky; tip of embolium and spot on base of corium, pale variety *parshleyi* typical
 (b) Femora black, apices pale; corium uniformly brownish black variety *fuscatus* n. var.
6. Antennal segment ii in length distinctly greater than width of head 7
 Antennal segment ii in length, just equal (female) to width of head, or (male) very slightly greater; femora fusco-brownish to black, front and middle femora more yellowish, a black spot on dorsal margin at apex, and with a second slightly larger subapical spot bearing two prominent bristles (p. 468) *waldeni* n. sp.
7. Antennae black, or at least segment i black 8
 Antennae pale, pubescence dusky; legs black, apices of femora and the tibiae pale, spines with small fuscous spots at base (p. 469) *piceicola* n. sp.
8. Legs testaceous to brownish; femora sometimes nearly black but never paler at apices, always tinged with brownish and reddish, hind pair strongly incrassate; coxae and tibiae testaceous to brownish, more or less tinged with reddish (463) *ancorifer*
 Legs chiefly black; femora more slender, black, apices of front and middle pairs pale; coxae deep black; tibiae pale to testaceous, black spots at base of spines (p. 464) *drakei* n. sp.

P. ancorifer (Fieber).

Reuter, Hem. Gymn. Eur., i, 104, pl. 7, fig. 7, 1878.

Brownish black to black, moderately shining; thickly clothed with yellowish to golden, closely appressed, sericeous pubescence, and intermixed with more erect blackish pubescent hairs; legs testaceous to brownish, femora frequently brownish black but uniformly colored and never paler at apices; tibiae testaceous to brownish, scarcely darker at base of spines.

Male: Length 4.2 mm., width 1.5 mm. Head: Width .84 mm., vertex .44 mm. Antennae: Segment ii, length 1.05 mm., black, sometimes brownish apically, slender, scarcely thicker apically. Pronotum: Length .81 mm., width at base 1.38 mm.

Female: Length 3.8 mm., width 1.7 mm. Head: Width .84 mm., vertex .44 mm. Antennae: Segment ii, length 1 mm., black, yellowish on apical half, slender, slightly thicker apically but scarcely attaining thickness of segment i. Pronotum: Length .77 mm., width at base 1.4 mm. Hemelytra becoming brownish or testaceous, frequently the cuneus distinctly reddish.

Recorded on *Alnus* in Europe; Mr. Bueno collected specimens on apple at White Plains, N. Y.

New Haven, 25 June, 1911 (J. K. Lewis).

***Psallus drakei* Knight, new species.**

Black, strongly shining; clothed with closely appressed, sericeous, deciduous silvery pubescence, and intermixed with more erect blackish pubescent hairs.

Male: Length 4.4 mm., width 1.7 mm. Head: Width .86 mm., vertex .39 mm.; black, shining, clothed with sericeous silvery pubescence. Rostrum, length 1.33 mm., extending to near hind margins of posterior coxae, black.

Antennae: Segment i, length .25 mm., black; ii, 1.02 mm., black, equaling thickness of segment i but more slender near base; iii, .58 mm., black; iv, .41 mm., blackish.

Pronotum: Length .72 mm., width at base 1.5 mm.; black, strongly shining, pleura as well as disk clothed with deciduous, silvery sericeous pubescence. Scutellum, sternum, pleura, and ostiolar peritreme, deep black.

Hemelytra: Embolar margins very slightly arcuate; uniformly black, shining; pubescence similar to that of pronotum. Membrane and veins uniformly fuscous, a small clear spot bordering apex of cuneus.

Legs: Black, middle and anterior femora pale at apex; tibiae pale, knees and apices fuscous, black spines with dark spot at base of each; apical tarsal segment fuscous. Venter black, strongly shining, silvery deciduous pubescence present on sides.

Female: Length 4 mm., width 1.89 mm.; very similar to male but embolar margins more arcuate. Pronotum: Length .77 mm., width at base 1.52 mm. Antennae: Segment ii, length 1.05 mm., black, brownish at middle.

Named in honor of the collector, Dr. C. J. Drake, to whom the author is indebted for many valuable specimens.

Holotype: Male, 6 July, 1917, Cranberry Lake, N. Y. (C. J. Drake); author's collection. Allotype: taken with the type. Paratypes: Males (2), 2 July, type locality. ALBERTA—Male, 31 July, 1921, Nordegg (J. McDunnough).

***P. morrisoni* Knight, new species.**

Black, elongate, suggestive of a *Plagiognathus* but distinguished by closely appressed, scale-like silvery pubescence; antennal segment ii of male distinctly longer than width of pronotum at base.

Male: Length 3.6 mm., width 1.25 mm. Head: Width .69 mm., vertex .33 mm., black, scarcely paler on vertex. Rostrum, length 1.38 mm., attaining hind margins of posterior coxae, black, segment iii and apex of ii yellowish.

Antennae: Segment i, length .28 mm., black; ii, 1.03 mm., black, brownish on middle or slightly beyond, slender, not attaining thickness of segment i; iii, .77 mm., testaceous to dusky; iv, .49 mm., pale fuscous.

Pronotum: Length .55 mm., width at base 1.03 mm.; black, pleura and disk clothed with closely appressed, scale-like silvery pubescence. Scutellum, sternum, pleura, and ostiolar peritreme, black.

Hemelytra: Embolar margins nearly straight; uniformly black, or ligneous black, slightly translucent; pubescence similar to that of pronotum and scutellum but rather finer. Membrane uniformly fuscous, veins and bordering apex of cuneus slightly paler.

Legs: Black, tips of femora slenderly pale; tibiae pale, knees and spots at base of spines blackish. Venter black, shining, scale-like silvery pubescence extending along sides.

Female: Length 3.2 mm., width 1.2 mm.; more ovate than the male but very similar in coloration. Antennae: Segment ii, length .94 mm., testaceous, black on basal one-fourth. Pronotum: Length .49 mm., width at base 1.01 mm.

Named in honor of the collector, Mr. Harold Morrison.

Holotype: Male, 27 July, 1921, Arnold Arboretum, Boston, Mass. (Harold Morrison); U. S. N. M. collection. Allotype: taken with type. Paratypes: Males and females (19), collected with types by sweeping *Myrica* spp. MASSACHUSETTS—Males (2), 21 Oct., 1915, Hyde Park (H. M. Parshley), on *Solidago*.

P. parshleyi Knight, new species.

Color aspect suggestive of *Plagiognathus fraternus* Uhler, but distinguished by the sericeous, semiscale-like pubescence on pleura and dorsum.

Male: Length 4.5 mm., width 1.7 mm. Head: Width .80 mm., vertex .34 mm.; black, vertex somewhat yellowish; pale pubescent, hairs on front slightly thickened. Rostrum, length 1.43 mm., scarcely surpassing hind margins of middle coxae, blackish, somewhat brownish on middle.

Antennae: Segment i, length .32 mm., black; ii, 1.26 mm., slightly thicker toward apex but not attaining thickness of segment i, black, pale pubescent; iii, .88 mm., fuscous; iv, .48 mm., fuscous.

Pronotum: Length .66 mm., width at base 1.37 mm.; black, moderately shining, clothed chiefly with pale, closely appressed, semiscale-like pubescence. Scutellum black, transversely rugulose, clothed with pale semiscale-like pubescence. Sternum, pleura, and ostiolar peritreme, black, pleura bearing pale semiscale-like pubescence.

Hemelytra: Elongate, embolar margins very slightly arcuate; pale yellowish pubescent, and intermixed with closely appressed, semiscale-like hairs on corium and clavus; black, basal half of cuneus, tip of embolium, and a small translucent spot near base of corium, pale. Membrane uniformly fuscous, a pale spot bordering apex of cuneus, veins dusky but slightly paler at apex of cells.

Legs: Pale yellowish, coxae fuscous at base; femora with dark

line forming above and below on apical half, anterior face with two rows of black spots, largest spots in subdorsal line, posterior face with three or four spots on apical half; tibiae yellowish, knees, spines and large spot at base of each, black; tarsi fuscous, more brownish on middle segment. Venter black, shining, pale pubescent.

Female: Length 4 mm., width 1.66 mm.; more robust than the male but very similar in coloration.

Named in honor of Dr. H. M. Parshley, who has contributed much to the knowledge of New England Heteroptera.

Holotype: Male, 23 July, 1917, Beach Bluff, Mass. (H. M. Parshley); author's collection. Allotype: taken with the type; collection of H. M. Parshley. Paratypes: MASSACHUSETTS—Males (4) and females (5), taken with types on small birch bushes, probably *Betula pumila*. MINNESOTA—Male and female, 4 July, female, 9 July, 1921, University Farm, St. Paul, collected at light; male and female, 12 July, 1919, males (5) and females (6), 2 Aug., 1920, Hennepin County (H. H. Knight), collected on *Betula pumila glandulifera*. NEW YORK—Female, 11 July, 1920, Cold Spring Harbor, Long Island (H. M. Parshley). Male, 4-7 July, 1915, Bayshore (C. E. Olsen).

***P. parshleyi* var. *fuscatus* Knight, new variety.**

Structurally not differing appreciably from the typical *parshleyi*; corium uniformly fusco-blackish; femora black, only the apices pale; antennal segment ii becoming yellowish or brownish at just slightly beyond middle, while in the typical *parshleyi* segment ii becomes brownish just before middle.

Holotype: Male, 20 Aug., 1920, Beaver Bay, Minn. (H. H. Knight); Minn. Univ. collection. Allotype: same data as the type. Paratypes: Male, taken with types. Male, 18 Aug., 1920, Carlton County, Minn. (H. H. Knight).

***Psallus alnicenatus* Knight, new species.**

Distinguished by the somewhat flattened, pale sericeous, almost scale-like hairs on pronotum, but more prominent on pleura.

Male: Length 4.5 mm., width 1.44 mm. Head: Width .72 mm., vertex .32 mm.; blackish, vertex yellowish brown. Rostrum, length 1.41 mm., attaining hind margins of intermediate coxae, yellowish brown, basal and apical segments blackish.

Antennae: Segment i, length .30 mm., black, slender apex pale; ii, 1.16 mm., black, narrow tip pale, sometimes the middle one-third or more, yellowish brown; iii, .83 mm., fuscous or pale fuscous; iv, .45 mm., pale fuscous.

Pronotum: Length .66 mm., width at base 1.22 mm.; blackish, basal half or less, yellowish brown to pale fuscous; clothed with pale yellowish pubescence, the propleura and disk anteriorly bearing somewhat flattened, pale sericeous, almost scale-like hairs. Scutellum and mesoscutum yellowish brown, the median line broadly blackish; sternum, pleura, and ostiolar peritreme, black, in pale specimens becoming slightly yellowish.

Hemelytra: Embolar margins nearly straight; pale yellowish

brown to dusky, semitranslucent, clavus and apical half of corium becoming infuscated, usually paler bordering radial vein, cuneus dark brownish to fuscous at apex; clothed with pale yellowish pubescence. Membrane infuscated, slightly paler on middle, veins pale yellowish, a clear spot bordering apex of cuneus.

Legs: Pale to yellowish, hind coxae fuscous at base; femora with two rows of black spots on anterior face, a black line forming along dorsal margin, hind femora with a ventral line on apical half; knees, tibial spines and spot at base of each, black, apical tarsal segment blackish. Venter black, moderately shining, finely pale yellowish pubescent.

Female: Length 3.7 mm., width 1.44 mm.; shorter and more robust than the male; frequently more broadly pale, cuneus uniformly yellowish translucent, sides of venter broadly pale; antennal segment ii yellowish brown on apical half but fuscous before apex.

Food plant: *Alnus incana* and probably other species of alder.

Holotype: Male, 3 July, 1920, McLean Bogs, Tompkins County, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (78), taken with the types on *Alnus incana*. MASSACHUSETTS—Female, 8 Aug., 1912, Chester (C. W. Johnson). MINNESOTA—Males (3), females (3), 30 June, 1922, Kings Bluff, Winona County (H. H. Knight). NEW YORK—Males and females (26), 26 July, 1916, McLean; males and females (24), 8 July, 1920, Ithaca (H. H. Knight). Male, 26 July, 1917, Cranberry Lake (C. J. Drake). NOVA SCOTIA—Male, 4 Aug., 1917, Truro (W. H. Brittain).

P. strobicola Knight, new species.

Fuscous black; antennae, and legs except coxae, yellow; clothed with closely appressed, sericeous silvery pubescence.

Male: Length 3.5 mm., width 1.33 mm. Head: Width .72 mm., vertex .33 mm. (measured across posterior corners of eyes); black, eyes reddish brown. Rostrum, length 1.25 mm., attaining hind margins of posterior coxae, yellow, basal segment blackish.

Antennae: Yellow; segment i, length .17 mm.; ii, .97 mm.; iii, .62 mm.; iv, .39 mm., slightly dusky.

Pronotum: Length .53 mm., width at base 1.08 mm.

Hemelytra: Embolar margins very slightly arcuate; uniformly fuscous black; clothed with closely appressed, sericeous silvery pubescence, and intermixed with more erect dark pubescence similar to that of pronotum and scutellum. Membrane and veins uniformly fuscous, not perceptibly paler bordering cuneus.

Legs: Yellow, coxae blackish except at apex; tibial spines black but without dark spots at base.

Female: Length 3.1 mm., width 1.36 mm.; more robust than the male but otherwise very similar.

Breeds on *Pinus strobus*.

Holotype: Male, 29 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (24), taken with the types on *Pinus strobus*. NEW YORK—Males and females (4), 8 July, females (2), 13 July, 1920, female, 26 July, 1916,

Ithaca; male, 21 June, 1914, Portageville; male and females (2), 11 July, 1920, Taghanic (H. H. Knight). Males and females (6), 8 July, 1919, male and female, 24 July, 1920, Cranberry Lake (C. J. Drake). QUEBEC—Males (2), 1 July, 1920, St. Hilarie (G. A. Moore).

P. alnicola Douglas and Scott.

Psallus alni Douglas and Scott, Brit. Hemiptera, 414, 1865.

Length 3.6 mm., width 1.4 mm.; carmine red, head, pronotal disk, and scutellum, flecked with fuscous; cuneus bright red, narrowly pale at base; membrane fuscous, slightly paler across middle; antennae yellowish, segment ii darker at apex; clothed with yellowish, sericeous pubescence and intermixed with more erect dusky pubescent hairs; legs yellowish but sometimes tinged with reddish, femora dotted with prominent blackish spots, tibial spines with black spots at base; sternum and base of genital segment fuscous.

Breeds on *Alnus rugosa* in cool humid surroundings.

Minnesota, New York. NEW HAMPSHIRE—Female, 24 Sept., 1907, Mt. Washington, alt. 2,500 ft. (O. Bryant).

***Psallus waldeni** Knight, new species.

Female: Length 2.5 mm., width 1.08 mm. Head: Width .66 mm., vertex .38 mm.; black, slightly paler on vertex. Rostrum, length 1.08 mm., yellowish, blackish only on apical segment, reaching upon hind coxae.

Antennae: Segment i, length .17 mm.; ii, .66 mm., slender, slightly thicker apically but not attaining thickness of segment i, very finely pale pubescent; iii, .43 mm.; iv, .28 mm.; black, last two segments pale fuscous.

Pronotum: Length .40 mm., width at base .9 mm., width anterior angles .57 mm.; fuscous black, scarcely shining; clothed with fine erect pubescent hairs and intermixed with closely appressed pale sericeous pubescence, propleura bearing only simple pubescent hairs. Scutellum black, mesoscutum moderately exposed, a pale spot at each side; sternum and propleura blackish, basalar plate yellowish.

Hemelytra: Embolar margins slightly arcuate; fusco-blackish, cuneus uniformly colored like the corium; pubescence similar to that on pronotal disk. Membrane uniformly pale fuscous, veins and narrowly bordering apex of cuneus, paler.

Legs: Yellowish to fusco-brownish, hind femora darker; femora with black spot on dorsal margin at apex, and with a second slightly larger subapical spot bearing two prominent bristles, front and middle pairs exhibiting a row of fuscous spots on lower margin of anterior face; tibiae pale, bearing two rows of very prominent black spines, length of spines nearly equal to twice thickness of segment, a large black spot at base of each spine, spots becoming obsolete on apical half of anterior pairs; tarsi fuscous. Venter black, pale pubescent.

Holotype: Female, 30 May, 1911, New Haven, Conn. (B. H. Walden); author's collection. Paratype: Female, taken with type.

P. piceicola Knight, new species.

Brownish black, hemelytra more brownish, antennae and base of cuneus pale.

Male: Length 3 mm., width 1.08 mm. Head: Width .60 mm., vertex at basal margin .34 mm., narrowest point on front .27 mm.; strongly inclined vertically, somewhat compressed; brownish black, pale yellowish pubescent. Rostrum, length 1.18 mm., extending behind posterior coxae, blackish, slightly paler on middle.

Antennae: Segment i, length .20 mm., thickness .057 mm., pale; ii, .66 mm., equal to thickness of segment i, slightly more slender at base, pale with a tinge of dusky, clothed with prominent pale to dusky pubescence; iii, .37 mm., dusky; iv, .34 mm., dusky.

Pronotum: Length .44 mm., width at base .91 mm.; dark brownish black, slightly shining, finely and closely yellowish pubescent, scale-like sericeous pubescence more evident on hemelytra. Scutellum and mesoscutum brownish black, yellowish pubescent. Sternum and pleura brownish black, the latter clothed with somewhat flattened, sericeous pale pubescence; ostiolar peritreme fuscous, anterior lobe bordering ostiole, pale.

Hemelytra: Embolar margins only very slightly arcuate; dark fusco-brownish to blackish, base of cuneus pale translucent, apex of embolium frequently pale; clothed with golden to dusky pubescence and intermixed with more closely appressed, silvery tomentose pubescence. Membrane pale fuscous, paler on middle and bordering apex of cuneus, veins somewhat pale or tinged with reddish.

Legs: Dark brownish black, apices of femora and the tibiae, pale; tibial spines brownish to blackish, a fuscous spot at base of each, both spots and spines paler apically; tarsi pale to dusky, fuscous at apex. Venter brownish black with a tinge of reddish, somewhat shining, finely pale yellowish pubescent.

Female: Length 2.86 mm., width 1.28 mm.; more robust than the male but very similar in coloration, hemelytra usually more brownish. Antennae: Segment i, length .22 mm., thickness .058 mm.; ii, .60 mm., nearly attaining the thickness of segment i but slightly more slender on basal half, clothed with prominent dusky pubescence; iii, .47 mm., slender; iv, .31 mm.; uniformly pale but with a dusky tinge, dusky pubescent.

Breeds on spruce (*Picea*).

Holotype: Male, 3 July, 1919, White Plains, N. Y. (J. R. T. Bueno); author's collection. Allotype: Female, 11 July, 1922, University Farm, St. Paul, Minn. (H. H. Knight). Paratypes. MINNESOTA—Males and females (38), taken with the allotype on spruce (H. H. Knight). Females (7), 27 Aug., 1920, Vermillion Lake, Minn. (H. H. Knight). Males and females (12), 12 Aug., 1922, Beaver Dam, Cook County (H. H. Knight). NEW YORK—Female, 29 June, females (2), 3 July, 1919, males (2), 5 July, 1920, White Plains (J. R. T. Bueno). Females (3), 28 July, 1920, Cold Spring Harbor, Long Island (H. M. Parshley), collected on spruce (*Picea*).

Lepidopsallus new genus.

Form short ovate, body clothed with closely appressed scale-like pubescence, and interspersed with more erect simple pubescent hairs; head broad, antennal segment ii, in length, not equal to width of head; tibiae strongly spinose; claws and pseudarolia as shown in figure 49: 3. Genotype: (*Sthenarus*) *rubidus* Uhler.

Differs from the genotype, *Europiella stigmosa* (Uhler), chiefly by shape of head, shortness of antennal segment ii, in type of pubescence, and in general by the more ovate and robust form.

Key to Species.

1. Rostrum extending beyond posterior coxae 2
Rostrum not extending beyond posterior coxae 3
2. Antennal segments i and ii pale yellowish; sides of venter without scale-like pubescence *claricornis* n. sp.
Antennal segment i black, base of segment ii dusky; sides of venter and pleura bearing scale-like pubescence *rostratus* n. sp.
3. Antennal segment ii scarcely longer than length of pronotum 4
Antennal segment ii, in length, equal to length of pronotum plus the dorsal width of an eye; small, length 2.7 mm. *olseni* n. sp.
4. Combined length of antennal segments iii and iv greater than length of segment ii; antennal segment ii thickened in both sexes, cylindrical and equal to thickness of segment i; black, length 2.6 mm. *minusculus* n. sp.
Combined length of antennal segments iii and iv less than or scarcely equal to length of segment ii; antennal segment ii more slender in female, distinctly thinner on basal half and not equal to thickness of segment i; color black with reddish, embolium and cuneus strongly reddish *rubidus*
(a) Color uniformly black, antennal segment ii always black; scale-like pubescence silvery white variety *atricolor* n. var.

L. rostratus Knight, new species.

Piceous black; antennal segment ii yellowish, dusky at base; rostrum extending to base of ovipositor.

Female: Length 2.8 mm., width 1.31 mm. Head: Width .74 mm., vertex .34 mm.; front and vertex more nearly flat and tylus more produced than in *claricornis*; black pubescent and intermixed with pale silvery scale-like hairs. Rostrum, length 1.47 mm., extending posteriorly as far as base of ovipositor, piceous.

Antennae: Segment i, length .17 mm., black; ii, .70 mm., slender, slightly thickened toward apex, yellowish, dusky at base; iii, .44 mm., pale fuscous; iv, .34 mm., fuscous.

Pronotum: Length .48 mm., width at base 1.06 mm.; rather thickly clothed with silvery, scale-like pubescence, and intermixed with black simple pubescence; propleura thickly covered with scale-like hairs. Scutellum with pubescence and coloration similar to disk of pronotum. Sternum, pleura, and ostiolar peritreme, uniformly black; episterna and pleura bearing scale-like hairs.

Hemelytra: Embolar margins moderately arcuate; uniformly piceous black; clothed with closely appressed, silvery scale-like

pubescence, and intermixed with more erect black pubescent hairs. Membrane and veins uniformly fumate, scarcely paler bordering apex of cuneus.

Legs: Black, tibiae and tarsi pale yellowish, basal half of hind tibiae becoming blackish, spines black but without spots at base, tips of tarsi fuscous. Venter black, brownish pubescent, sides bearing silvery scale-like pubescence.

Holotype: Female, 18 Aug., 1920, Elkhorn Creek, Carlton County, Minn. (H. H. Knight); Minn. Univ. collection.

L. claricornis Knight, new species.

Brownish black, antennae and tibiae pale; rostrum extending to middle of venter.

Female: Length 3.1 mm., width 1.47 mm. Head: Width .80 mm., vertex .36 mm.; yellowish pubescent. Rostrum, length 1.56 mm., reaching upon base of ovipositor, brownish black like the head.

Antennae: Segment i, length .19 mm., pale yellowish; ii, .77 mm., slightly thickened from base toward apex, uniformly yellowish, dusky pubescent; segments iii and iv missing.

Pronotum: Length .54 mm., width at base 1.23 mm.; brownish pubescent and intermixed on disk with closely appressed pale scale-like pubescence, propleura bearing simple pubescent hairs without any indication of scale-like pubescence. Scutellum uniformly brownish black like the pronotum, bearing scale-like pubescence intermixed with simple pubescent hairs. Sternum, pleura, and ostiolar peritreme, uniformly dark brownish, pleura bearing fine brownish pubescence only.

Hemelytra: Embolar margins slightly arcuate; uniformly brownish black, brownish pubescent and intermixed with closely appressed, pale scale-like hairs. Membrane uniformly pale brownish, scarcely paler bordering apex of cuneus, veins brownish.

Legs: Brownish black, tips of coxae and femora slightly paler; tibiae pale yellowish, spines black but without dark spot at base of each; tarsi pale, apices fuscous. Venter dark brownish, pubescence brownish.

Holotype: Female, 29 May, Lakehurst, N. J. (Wm. T. Davis); author's collection.

L. rubidus (Uhler).

Uhler, Hemiptera Colo., 41, 1895.

Male: Length 3.2 mm., width 1.5 mm.; blackish, hemelytra reddish brown with fuscous, embolium and cuneus strongly reddish; membrane uniformly fuscous; clothed with pale yellowish, closely appressed, scale-like pubescence and intermixed with more erect dusky, simple pubescent hairs; femora fusco-brownish, tinged with reddish; tibiae brownish to reddish, beset with prominent black spines. Antennae fuscous to ferruginous; segment i, length .16 mm.; ii, .64 mm., in length not equal to width of head

(width .81 mm.), equal in thickness to segment i but more slender on basal one-fourth, usually paler on apical half; iii, .36 mm.; iv, .31 mm. Pronotum: Length .62 mm., width at base 2.38 mm.

Female: Length 3.5 mm., width 1.53 mm.; width of head .86 mm., vertex .41 mm.; antennal segment ii, length .61 mm., more slender than in the male, gradually tapering thicker toward apex but scarcely attaining thickness of segment i.

Breeds on *Salix*.

New York.

***L. rubidus* var. *atricolor* Knight, new variety.**

Structurally not differing appreciably from *rubidus* but uniformly black in color; tibiae somewhat reddish or testaceous apically; antennal segment ii always black; scale-like pubescence silvery white.

Holotype: Male, 10 Aug., 1916, Batavia, N. Y. (H. H. Knight); author's collection. Paratypes: Males and females (4), taken with the type. MINNESOTA—Males and females (24), 12 July, 1919, Hennepin County (H. H. Knight). NEW YORK—Male, 7 Aug., 1917, Wanakena (C. J. Drake). VERMONT—Male, 15 June, 1908, Brattleboro (C. W. Johnson).

***Lepidopsallus minusculus* Knight, new species.**

Ovate, robust; black, moderately shining, clothed with silvery white, closely appressed, scale-like pubescence and intermixed with more erect yellowish to dusky pubescence.

Male: Length 2.4 mm., width 1.28 mm. Head: width .68 mm., vertex .34 mm. Rostrum, length 1.03 mm., attaining hind margins of posterior coxae.

Antennae: Segment ii, length .60 mm., cylindrical, equal in thickness to segment i; iii, .36 mm., pale fuscous; iv, .23 mm., pale fuscous.

Pronotum: Length .51 mm., width at base 1 mm. Pleura black, beset with conspicuous silvery white scales; ostiolar peritreme black, with two or three scales on dorsal lobe.

Hemelytra: Embolar margins strongly arcuate; scale-like pubescence rather closely but irregularly placed, each scale truncate at apex and quite as distinct as are the scales of certain Lepidoptera. Membrane and veins uniformly fuscous, scarcely paler bordering apex of cuneus.

Legs: Black, tarsi fuscous; tibial spines large, length of some equal to more than twice thickness of tibia. Venter black, also clothed with silvery scales.

Female: Length 2.6 mm., width 1.48 mm.; slightly larger and more robust than the male. Head: Width .71 mm., vertex .38 mm.

Antennae: Segment ii, length .60 mm., cylindrical, equal in thickness to segment i; iii, .36 mm., pale fuscous; iv, .23 mm., pale fuscous.

Holotype: Male, 10 July, 1915, White Plains, N. Y. (J. R. T. Bueno); author's collection. Allotype: taken with the type. Paratypes: Male and female, taken with the types on apple.

L. olseni Knight, new species.

Slightly larger than *minusculus*, very similar in color but in form more flattened above; distinguished by the long and slender antennal segment ii which is equal to length of pronotum plus dorsal width of an eye.

Female: Length 2.7 mm., width 1.28 mm. Head: Width .76 mm., vertex .34 mm. Rostrum (imbedded in glue).

Antennae: Segment i, length .17 mm.; ii, .68 mm., slender, gradually thickened from base toward apex but not attaining thickness of segment i; iii, .34 mm.; iv, missing.

Pronotum: Length .43 mm., width at base 1.01 mm.; clothed with silvery scale-like pubescence and intermixed with more erect, simple pubescent hairs.

Hemelytra: Embolar margins moderately arcuate; silvery scales not so distinctly truncate at apex as in *minusculus*. Membrane pale fuscous, veins fuscous to reddish brown.

Legs: Black, tibiae more reddish black. Venter sparsely beset with silvery scales and interspersed with more erect simple pubescence.

Named in honor of the collector, Mr. Chris E. Olsen.

Holotype: Female, 28 July, 1916, Pigeon Cove, Mass. (C. E. Olsen); author's collection.

Tribe **ONCOTYLINI**.*Key to Genera.*

1. *Pseudarolia* connate with claw for their full length; claws broadly curved 2
Pseudarolia attached only at basal angles and extending free and parallel with them, usually to the tips; claws short and strongly incurved (p. 474) **Macrotylus**
2. *Pseudarolia* extending beyond tips of claws (fig. 49: 13); rostrum not extending beyond hind coxae (p. 474) **Lopus**
Pseudarolia not attaining apex of claw, extreme tips sharply incurved; rostrum extending to middle of venter
 (p. 473) **Megalocoleus**

Megalocoleus Reuter.**M. molliculus** (Fallen).

Phytocoris molliculus Fallen, Hemip. Suec., 82, 1829.

Macrocoleus molliculus Reuter, Hem. Gymn. Eur., ii, 226, 1879.

Male: Length 5.4 mm., width 1.89 mm.; pale greenish white to yellowish, disk of corium sometimes slightly darkened with fuscous; membrane pale to fumate, smaller areole and a spot near tip of cuneus darker; dorsum clothed with prominent, more or less erect, pale yellowish to dusky pubescence; rostrum attaining middle of venter, blackish at apex.

Female: Length 4.5 mm., width 1.91 mm.; more robust than the male but very similar in coloration.

Occurs on *Tanacetum* and *Achillea* in Europe.

Beach Bluff, Mass.

Lopus Hahn.**L. decolor** (Fallen).

Capsus decolor Fallen, Monog. Cim. Suec., 102, 1807.

Onychumenus decolor Saunders, Het. Brit. Islds., 297, pl. 27, fig. 10, 1892.

Length, male, 4.8 mm., width 1.6 mm.; female, length 4 mm., width 1.4 mm.; pale with dusky brown, antennae darker brown; tarsi and claws black.

Breeds on sedges; found in numbers and was observed to oviposit in the stem of *Juncus dudleyi* at McLean, New York.

Colebrook, 21 July, 1905 (H. L. V.); Cornwall, 18 July, 1921 (B. H. W.); Litchfield, 22 July, 1920 (P. G.); New Haven, 11 July, 1904 (P. L. B.), 11 July, 1920, 20 July, 1904 (B. H. W.); Salem, 11 July (H. W. Foote); West Thompson, 12 Aug., 1905 (H. L. V.).

Macrotylus Fieber.***M. amoenus** Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 75, 1909.

Length 2.2 mm., width .8 mm.; yellowish green, the hemelytra darker green; antennal segments i and ii black, apices white; tibiae black, femora with a black bar on the dorsal margin; cuneus with two yellow spots separated with black; membrane fuscous, with a clear spot on each side near the margin.

Guilford, 13 July, 1920 (P. G.); Westville, 4 July, 1904 (W. E. B.), type locality.

M. sexguttatus (Provancher).

Pet. Faune Ent. Can., iii, 150, 1887.

Length 3 mm., width 1.1 mm.; black; apex of antennal segment ii pale; head greenish; base and apex of cuneus clear; membrane with a large clear spot on each side near the apex.

Found breeding on *Aster undulatus* at Batavia, New York.

New Haven, 16 June, 1920 (B. H. W.).

Tribe Hallodapini.*Key to Genera.*

1. *Pseudarolia* connate with claws (fig. 49: 15, 16) 2
Pseudarolia attached at base of claws, free apically but extending practically parallel with claw (fig. 49: 17); females usually wingless (p. 475) **Coquillettia**
2. Antennal segment ii nearly linear, slightly thickened apically but not exceeding twice thickness of basal half; females brachypterous (p. 475) **Orectoderus**
Antennal segment ii distinctly clavate, thickness on apical half exceeding twice that of basal half; females macropterous
..... (p. 476) **Teleorhinus**

Coquillettia Uhler.**C. mimetica Osborn.**

Proc. Iowa Acad. Sci., v, 236, 1898.

Male: Length 6.4 mm., width 1.77 mm.; ferrugino-testaceous, abdomen, tarsi, and antennal segment ii, becoming fuscous; basal half of corium transparent, apical part bright ferrugino-testaceous but slenderly margined with fuscous; basal one-third of cuneus white, slightly translucent, membrane and apical two-thirds of cuneus blackish.

Female: Length 5.5 mm., wingless; ant-like in form, head wider than pronotum; abdomen with first two segments constricted to form a pedicel, the remaining segments forming a globose, polished, minutely and sparsely haired body with conspicuous pleural fold; color brown, antennal segments iii, iv, and apex of ii, tarsi and apices of tibiae, fuscous to blackish; globose portion of abdomen and dorsum of second segment, dark chestnut or piceous.

Occurs on elevated grassy ridges (Osborn).

Iowa, North Carolina.

Orectoderus Uhler.**O. obliquus Uhler.**

Bull. U. S. Geol. Geog. Surv., i, 319, 1876.

Male: Length 7.7 mm., width 1.8 mm.; shining black, basal half of cuneus, base of corium and extending to near middle of hemelytra, pale or translucent; legs reddish to piceous.

Female: Length 5.8 mm., brachypterous; ant-like in form, head broader than pronotum; hemelytra greatly reduced, extending to base of abdomen, there turning upward, the tips tapering to a point and vertical; two basal segments of abdomen constricted into a pedicel, the remaining segments forming a globose portion, the pleural fold prominent from base to eighth segment inclusive; color piceous to black, antennae brownish to fuscous, segment iv and tips of ii and iii, blackish.

Granby, 21 May, 1920 (M. P. Z.).

O. obliquus var. ferrugineous Knight, new variety.

Female: Similar in structure to the typical female of *obliquus* but differs in color aspect; ferrugino-testaceous, apex of antennal segment ii piceous, globose portion of abdomen black.

Mr. Olsen took these specimens in company with a reddish colored ant (*Camponotus castaneus*) which this form resembles very closely.

Holotype: Female, 4-7 July, Bayshore, Long Island, N. Y. (Chris E. Olsen); author's collection. Paratypes: Females (2), taken with the types.

Teleorhinus Uhler.

T. tephrosicola Knight, new species.

Male: Length 7.3 mm., width 2.2 mm.; differs from *cyaneus* Uhler in that the combined length of antennal segments iii and iv is greater than the length of segment ii; clavate portion of segment ii only twice as thick as segment i, while in *cyaneus* the apical half of segment ii is three times the thickness of segment i.

Antennae: Segment i, length .36 mm., black; ii, 2.05 mm., apical two-fifths clavate, .17 mm. thick, yellowish, the clavate portion black; iii, 1.39 mm., slender, fuscous, slightly paler at base; iv, .97 mm., fuscous.

Black, shining, minutely pubescent, very similar to *cyaneus* but differs in form of anterior angles of pronotum; legs pale reddish yellow, coxae whitish but blackish at base; rostrum brownish but darker at base and apex.

Female: Length 7.6 mm., width 2.5 mm.; not differing materially in form or color from the male.

Holotype: Male, 11 July, 1916, Yaphank, Long Island, N. Y. (Wm. T. Davis); author's collection. Allotype: taken with the type. Paratype: Female, 17 June, 1906, Lakehurst, N. J. (Wm. T. Davis). Mr. Davis took the type specimens on flowers of *Tephrosia* sp.

Subfamily DICYPHINAE.

Key to Genera.

1. Pseudarolia prominent (fig. 49: 18-20) 2
 Pseudarolia absent (fig. 49: 21); hemelytra hyaline, glassy, ovate,
 with a sharply defined inverted Y-shaped red or fuscous mark
 (p. 478) *Hyaliodes*
2. Calli distinctly impressed at basal margin, and thus the pronotal
 disk rather distinctly transversely sulcate (p. 476) *Dicyphus*
 Calli not or scarcely impressed at basal margin, pronotal disk not
 transversely sulcate 3
3. Eyes small, head elongated behind eyes for a space equal to
 lateral width of an eye (p. 478) *Macrolophus*
 Eyes large, head space behind eyes not equal to half the lateral
 width of an eye [*Cyrtopeltis*]

Dicyphus Uhler.

Key to Species.

1. Ostiolar peritreme strongly protruding, ostiole large and clearly
 exposed 2
 Ostiolar peritreme scarcely raised from the pleural wall, ostiole
 inconspicuous or quite concealed; head and pronotum black, collar
 and ray between calli pale, hemelytra chiefly pale *agilis*
2. Eyes removed from pronotal collar for a space equal to dorsal
 width of an eye; hemelytra conspicuously colored with red
 *famelicus*
 Eyes removed from pronotal collar for a space equal to less than
 dorsal width of an eye; hemelytra darkened with fuscous,
 rarely tinged with reddish *discrepans* n. sp.

D. agilis (Uhler).

Bull. U. S. Geol. Geog. Surv., iii, 425, 1877.

Male: Length 3.4 mm., width .9 mm.; female, length 4.5 mm., width 1.1 mm.; pale yellowish, head, thorax, and segment ii of antennae, chiefly black; hemelytra pale, lightly marked with fuscous, sometimes tinged with red.

Food plant: *Rubus odoratus*, and possibly others.

Colebrook, 21 July, 1905 (H. L. V.); Guilford, July (B. H. W.); Hamden, 25 June, 1911 (B. H. W.); New Haven, 15 June, 1904 (W. E. B.), 1 June, 1911 (B. H. W.); Poquonock, 27 June, 1905 (H. L. V.).

D. famelicus (Uhler).

Proc. Boston Soc. Nat. Hist., xix, 413, 1878.

Length 4.8 mm., width 1.2 mm.; pale yellowish, head and thorax dull reddish; hemelytra and scutellum with dull reddish markings; membrane infuscated, brachium reddish near cuneus.

Food plant: *Rubus odoratus*.

Massachusetts, New York, New Hampshire, Vermont.

D. discrepans Knight, new species.

Male: Length 8.3 mm., width .94 mm. Head: Width .55 mm., vertex .22 mm., length .49 mm., from hind margin of eye to collar .11 mm.; black, shining, pale on vertex, darkened along median line. Rostrum, length 1.53 mm., attaining posterior margins of hind coxae, pale, darkened at extreme tip.

Antennae: Segment i, length .36 mm., pale, darkened at base and apex; ii, .97 mm., apical one-third black, pale at middle and infuscated at base; iii, .77 mm., dark fuscous, pale at base; iv, missing.

Pronotum: Length along median line .44 mm., to line drawn between basal angles .55 mm., width at base .77 mm., collar .38 mm.; calli confluent, transverse, convex, a transverse impression just behind which continues over the sides of disk; basal margin of disk strongly sulcate, exposing mesonotum broadly, basal angles rounded, lateral margins sulcate, coxal cleft visible from above, collar flat, separated from calli by a transverse impression which connects at each side with coxal cleft; pale, pleura blackish. Scutellum triangular, infuscated along median line, pale at each side; mesonotum broadly exposed, pale to reddish, a rounded fuscous spot at middle which continues under pronotum, also a smaller one at basal angles. Sternum black, shining, pleura pale to brownish; ostiolar peritreme strongly convex, alutaceous, pale, a horn-shaped reddish opaque tract curving dorsad from the large and conspicuous ostiole.

Hemelytra: Width .94 mm., pale translucent, disk of clavus and corium lightly infuscated, a dark spot at apex of embolium, apex of cuneus black. Membrane pale, lightly infumed at middle of apical half, veins infuscated.

Legs: uniformly pale yellowish, clothed with fine, short black hairs. Venter black, shining, genital segment yellowish.

Female: Length 4 mm., width 1.05 mm.; very similar to the male in form and coloration.

Some of the Minnesota specimens have the membrane shortened to little longer than the cuneus.

This form differs from the description of *vestitus* Uhler in having antennal segment ii pale, and black only at apex and base, in the paler scutellum with only median line dark, and if the original description is correct, in the much longer antennal segment ii which in *discrepans* greatly exceeds length of pronotum.

Food plant: *Aster* sp.

Minnesota, New Hampshire, New York.

Holotype: Male, 7 July, 1917, Cranberry Lake, N. Y. (C. J. Drake); author's collection. Allotype: same data as the type. Paratypes: Females (2), topotypic. Males (2) and females (6), 30 Aug., 1919 Kawishiwi River, St. Louis County, Minn. (H. H. Knight).

Macrolophus Fieber.

M. separatus (Uhler).

Proc. Zool. Soc. London, for 1894, 194.

Length 4.5 mm., width 1.1 mm.; greenish yellow; hemelytra pale, with numerous black dots, one at base of each black hair; spot near apex of embolium, tip of cuneus, antennal segment i and apex of ii, black; membrane pale fuscous, a large pale spot near apex of cuneus.

Branford, 21 July, 1920 (B. H. W.); East River, 30 July, 1910 (C. R. E.).

Hyaliodes Reuter.

H. vitripennis (Say).

Compl. Writ., i, 345, 1859.

Length 4.8 mm., width 1.7 mm.; hemelytra hyaline, glassy, with black or red bordering the scutellum, inner edge of clavus and corium, and across apex of corium to lateral margin, also dark on membrane, veins, and tip of cuneus; pronotum and antennae variously marked with red and black.

Occurs on several plants, frequent on *Vitis*; predaceous on plant lice.

Branford, 26 July, 1904 (W. E. B.); Mount Carmel (Hamden), 24 July, 1904 (W. E. B.); New Canaan, 14 Sept., 1905 (W. E. B.); New Haven, 7 July, 1905 (B. H. W.).

Subfamily BRYOCORINAE.

Key to Genera.

1. Pronotum without a distinct collar; pronotum posteriorly gibbous, often strongly so; pronotum coarsely punctured 2

- Pronotum with a distinct collar; pronotum not gibbous posteriorly; sparsely punctured; antennal segment i shorter than the interocular space **Monalocoris**
2. Pronotum posteriorly strongly gibbous, a longitudinal impression at least in the middle; embolium broadly expanded and flat, not thickened **Pycnoderes**
- Pronotum posteriorly moderately gibbous, without longitudinal impressions; embolium narrow, thickened, rope-like **Sixeonotus**

Monalocoris Dahlbom.

M. filicis Linnaeus.

Cimex filicis Linnaeus, Syst. Nat., Edn. 10, i, 443, 1758.

Saunders, Het. Brit. Islds., 130, 1892.

Length 2.5 mm., width 1.4 mm.; short oval, convex; brown to dark brown, shining, pronotum finely punctured; legs and antennae pale yellowish brown.

Occurs on shield fern (*Aspidium spinulosum*).

Huntington, 9 July, 1920 (P. G.); Lyme, 20 Aug., 1910 (B. H. W.); Putnam, 12 July, 1905 (H. L. V.).

Pycnoderes Guérin.

P. dilatatus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 3, 1909.

Length 4 mm., width 1.7 mm.; black, two spots on embolium, cuneus, membrane, legs excepting apical half of posterior femora, and antennae, white or pale yellowish; posterior area of pronotal disk strongly gibbous, having three longitudinal impressions, coarsely punctured.

New Jersey.

Sixeonotus Reuter.

S. insignis Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 78, 1876.

Length 3 mm., width 1.7 mm.; black; legs and antennae yellowish white; apical half of the membrane pale.

Occurs on skunk cabbage (*Symplocarpus*).

Colebrook, 27 July, 1905 (H. L. V.).

S. tenebrosus Distant.

Biol. Centr. Amer., Het., i, 441, 1893.

Length 2.7 mm., width 1.5 mm.; black; only the coxae, trochanters, and tarsi yellowish white; apex of the membrane pale.

Maryland.

Subfamily CYLAPINAE.

Key to Tribes.

1. Antennae exceedingly long, much longer than the body, segment i thickened, the remaining segments thread-like; pronotum laterally not margined, or rarely obsoletely margined; calli short, scarcely attaining the middle of the disk **Cylapini**

Antennae not longer than the body, segment iii not equaling ii in length; pronotum with the sides wholly or at least posteriorly margined; calli large and convex, at least attaining the middle of the diskFulvini

Tribe CYLAPINI.

Cylapus Say.

C. tenuicornis Say.

Compl. Writ., i, 347.

Length 5.5-6 mm., width 2.2 mm.; brownish gray and marked with white, distinguished by the long slender antennae and prominent protuberant eyes.

A very active species, usually found on dead and fungus covered tree trunks.

Portland, 10 Aug., 1919 (B. H. W.).

Tribe FULVINI.

Fulvius Stål.

F. brunneus (Provancher).

Nat. Can., iv, 104, 1872.

Length 3.4 mm., width 1.1 mm.; brown, marked with yellowish and white; antennal segment ii pale yellowish, femora brown like the pronotum, basal half of cuneus white, apex of scutellum and an area on hemelytra, pale.

New Haven, 28 Aug., 1910 (B. H. W.).

F. imbecilus (Say).

Compl. Writ., i, 345, 1859.

Length 4 mm., width 1.2 mm.; very similar to *brunneus* but larger; antennal segment ii brown with the apical one-third white, femora yellowish brown, scutellum dark brown.

New Jersey.

Subfamily CLIVINEMINAE.

Largidea Van Duzee.

L. davisi Knight.

Ent. News, xxviii, 7, 1917.

Length 6 mm., width 2.3 mm.; fuscous Indian red, shading to black on the head, calli, sternum, and parts of the abdomen; length of antennal segment ii only slightly greater than width of head across eyes, incrassate in the female and thick linear in the male; first tarsal segment expanded and flat on ventral surface; pronotum coarsely and hemelytra obsoletely punctured; calli outlined by an impressed, smooth line which runs forward and down on the side to coxal cleft.

Occurs on *Pinus*.

Promised Land, Long Island, N. Y. Male, 10 Aug., 1899, Hyannis Port, Mass. (J. L. Zabriskie).

Subfamily DERAECORINAE.

Key to Genera.

1. Antennae linear, very long and of nearly equal thickness throughout; vertex transversely striate and longitudinally sulcate; segment ii of hind tarsi much shorter than i or iii; usually large elongate species (p. 481) **Eustictus**
Antennae not so long or linear, segment ii slender at base and slightly enlarged toward apex; vertex usually polished; segment ii of hind tarsi equally long as i or iii, or nearly so 2
2. Head strongly produced and nearly horizontal, facial angle acute, tylus projecting beyond apex of first antennal segment; dorsum thickly covered with stiff erect pubescence; embolar margin thin and broadly expanded, sides nearly parallel
(p. 484) **Eurychilopterella**
Head less produced, scarcely surpassing middle of first antennal segment, facial angle either a right angle or only slightly less; dorsum either pubescent or practically glabrous; embolium not as the above (p. 484) **Deraeocoris**

Eustictus Reuter.

Key to Species.

1. Hind tibiae with long pilose hairs on basal half, distinctly longer than true spines 2
Hind tibiae with minute pubescence only, pubescent hairs not attaining length of true spines 3
2. Pronotal disk uniformly brownish black; legs chiefly reddish, tibiae not distinctly banded with paler; length 8-11 mm. **grossus**
Pronotal disk blackish but paler near basal margin; legs pale testaceous and marked with black, tibiae distinctly marked with four alternating pale and fuscous bands **venatorius**
3. Pronotal disk with median portion black, lateral margins broadly pale except for dark punctures; male, width of vertex equal to little more than thickness of antennal segment i; length, male, 6.9 mm., female, 7.4 mm. **salicicola** n. sp.
Pronotal disk chiefly brownish black, not paler on lateral margins; male, width of vertex equal to twice thickness of antennal segment i; length, male, 5.5-6 mm., female, 7 mm. **necopinus** n. sp.
(a) Pronotal disk blackish but with paler maculae; female antennal segment i, in length, equal to twice the width of vertex variety **necopinus** typical
(b) Pronotal disk uniformly brownish black; female antennal segment i, in length, not equal to twice the width of vertex variety **discretus** n. var.

E. necopinus Knight, new species.

Male: Length 5.6 mm.; allied to *venatorius* but smaller, width of vertex equal to twice thickness of antennal segment i, pronotum not distinctly paler on basal half, pubescent hairs on hind tibiae not attaining length of true spines.

Head: Width .98 mm., vertex .28 mm.; eyes less prominent than in either *venatorius* or *catulus*, scarcely raised above level of vertex; height of eye .61 mm.

Antennae: Segment i, length .75 mm., greatest thickness .069 mm., pale and marked with black; ii, 2.16 mm., brownish black, clothed with fine short pubescence; iii, 1.11 mm., black, paler on apical one-third; iv, .88 mm., black.

Pronotum: Brownish black, disk with a few small paler spots, slender margins and collar pale, coxal margin also pale. Scutellum black, spot at basal angles and vitta on apex pale.

Hemelytra: Width 2.08 mm.; pale translucent, irregularly marked with dark fuscous; cuneus clear, apical half and inner basal angle blackish; membrane pale, veins and invading membrane each side, brownish to fuscous.

Legs: Brownish black, femora paler basally, mottled apically; tibiae with four pale marks but not forming complete bands.

Venter: Reddish brown to blackish, paler beneath and spotted with reddish; genital claspers distinctive.

Female: Length 7 mm., width 2.6 mm.; larger than the male but very similar in coloration. Head: Width 1.09 mm., vertex .43 mm. Antennae: Segment i, length .86 mm.; ii, 2.57 mm.; iii, 1.24 mm.; iv, 1 mm.

Holotype: Male, 4 July, 1919, White Plains, N. Y. (J. R. T. Bueno); author's collection. Allotype: Female, 8 Aug., 1918, Ontario, Can. (H. S. Parish). Paratype: Male, taken with type.

Mr. Bueno collected the type on Aspen.

****E. necopinus* var. *discretus* Knight, new variety.**

Female: Length 7 mm., width 2.44 mm.; pronotal disk uniformly brownish black, without paler maculae. Head: Width 1.05 mm., vertex .50 mm. Antennae: Segment i, length .94 mm., brownish black, paler maculae not distinct; ii, 2.72 mm., brownish black, spots not apparent, clothed with short pale or dusky pubescence; iii, 1.22 mm., brownish black, paler apically; iv, 1.05 mm., dark brownish black.

Holotype: Female, 26 July, 1910, Wallingford, Conn. (D. J. Caffrey).

Very likely this form may prove to be a distinct species.

***Eustictus salicicola* Knight, new species.**

Male: Length 6.9 mm.; related to *venatorius* but differs in the antennae, tibial pubescence, and in color pattern of the dorsum.

Head: Width 1.19 mm., vertex .08 mm., height of eye .77 mm.; eyes prominent, projecting above vertex and below gula.

Antennae: Segment i, length .81 mm., pale and marked with black; ii, 2.31 mm., dark fuscous, paler on basal one-sixth but dark spots are visible, extreme apex paler; rather densely covered with fine short pale pubescence, a few hairs slightly longer but in length not exceeding thickness of segment; iii, 1.05 mm., blackish, paler apically; iv, .91 mm., blackish.

Pronotum: Median portion of disk black, lateral margins broadly pale except for dark punctures; propleura brownish black, lower margins pale. Scutellum black, basal angles paler;

minutely, sparsely pubescent. Sternum dark fuscous, paler on median line and at sides; ostiolar peritreme pale, invaded with fuscous above.

Hemelytra: Width 2.5 mm.; glabrous, pale translucent and marked with fuscous but without large spots on basal half as on *venatorius*; clavus black each side of commissure, slender dark marks bordering claval vein; corium with punctures, radius, and large spot on inner apical angle, dark fuscous to black; embolium scarcely darkened at apex, the extreme outer edge blackish. Cuneus pale translucent, inner apical margin blackish. Membrane pale, fumate within areoles, veins slightly darker, a fuscous mark bordering apical margin of larger areole; also a pale fuscous cloud on apical half each side beyond the areoles.

Legs: Pale and marked with blackish; femora with apical half marked and spotted with blackish, an irregular pale but spotted subapical annulus; tibiae with four paler bands but more or less interrupted with dark spots, pubescence short, not attaining length of true spines.

Venter: Pale greenish and maculated with reddish, ventral surface of genital segment blackish, an impressed dark spot beneath each spiracle; genital claspers distinctive of the species.

Female: Length 7.4 mm., width 2.77 mm.; very similar to male in coloration but differs in the pilose character of antennae. Head: Width 1.08 mm., vertex .39 mm., height of eye .69 mm., eyes less prominent than in male. Antennae: Segment i, length .91 mm., beset with several erect hairs, pale and irregularly spotted with black; ii, 2.5 mm., ground color pale but closely spotted and shaded with brownish black, extreme apex pale or reddish, beset with erect pale pilose hair, length of hairs exceeding twice thickness of segment; iii, .97 mm., blackish, paler apically, basal half beset with pilose hairs; iv, .83 mm., blackish.

The writer took all his specimens on willow (*Salix*) where both nymphs and adults were found on the bark of the trees, indicating that the species is predaceous.

Holotype: Male, 18 June, 1921, Phalen Park, Ramsey County, Minn. (H. H. Knight); Minn. Univ. collection. Allotype: 11 Aug., 1920, St. Anthony Park, Minn. (H. H. Knight). Paratypes: Males (3), taken with the holotype. MINNESOTA—Male, 20 June, 1921, New Ulm (H. H. Knight). MISSISSIPPI—Male, 21 Apr., 1915, Agricultural College (H. F. Wallace). SOUTH DAKOTA—Male, 30 June, 1921, Brookings (H. C. Severin).

E. venatorius Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 479, 1912.

Male: Length 7.4 mm., width 2.5 mm.; pale and mottled with fuscous and black; antennae irregularly annulated and mottled with black, more distinctly so than in *grossus*; dorsum rather sparsely beset with pale erect pilose hairs; hind tibiae with long pilose hairs on basal half, distinctly longer than true spines.

Female: Length 8.2 mm., width 2.8 mm.; more robust than the male but very similar in coloration.

Found on hickory by Van Duzee.

New York.

E. grossus Uhler.

Ent. Amer., iii, 70, 1887.

Male: Length 8 mm., width 2.6 mm.; brownish with fuscous, pronotum and scutellum nearly black; dorsum not mottled as in *venatorius*, cuneus usually reddish at base; femora reddish brown to blackish, never mottled; ventral parts sometimes reddish brown; dorsum and hind tibiae beset with long pilose hairs as in *venatorius*.

Female: Length 8.6-10 mm., width 2.9-3.5 mm.; very similar to the male but larger and more robust.

Massachusetts, New Jersey, New York.

Eurychilopterella Reuter.

E. luridula Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 60, 1909.

Male: Length 4.5 mm., width 1.8 mm.; fuscous to black on a pale background; pronotum coarsely punctured; dorsum clothed with stiff erect pubescent hairs.

Female: Length 4.4 mm., width 1.03 mm.; more robust than the male but very similar in coloration.

Occurs on apple trees; evidently predaceous in habits.

New York.

Deraeocoris Kirschbaum.

Key to groups of Deraeocoris.

1. Claws deeply cleft near base (fig. 49: 29-30) 2
Claws not cleft or with only a slight indication (fig. 49: 28) 7
2. Scutellum punctate 3
Scutellum impunctate 5
3. Hind tibiae without distinct spines, clothed only with prominent black hairs .. (Exotic group containing genotype *olivaceus* Fabricius)
Hind tibiae with a row of distinct spines on the anterior face 4
4. Pronotum distinctly margined; eyes with hind margins practically in line with base of head, nearly in contact with collar; segment i of antennae surpassing tip of tylus by less than half its length (p. 485) Group A (subgenus *Camptobrochis* Fieber)
Pronotum immarginate; eyes sloping forward away from collar; segment i of antennae extending beyond tip of tylus by more than one-half its length (p. 496) Group E
5. Dorsum practically glabrous, at most only sparsely and finely pubescent (not rubbed specimens), rarely a few hairs at anterior angles of pronotum; hind tibiae with a row of spines or heavily chitinized hairs on the anterior face 6
Dorsum heavily pubescent or hairy, at least with long hairs at anterior angles of pronotum; hind tibiae without distinct spines on the anterior face, usually rather closely set with prominent long hairs (p. 495) Group D (subgenus *Euarmosus*)

6. Form elongate, width not equal to one-half the length (p. 486) Group B
 Form broad oval, strongly convex, width greater than or equal to
 at least one-half the length of the insect (western species)
7. Scutellum punctate (western species)
 Scutellum impunctate (p. 492) Group C

Key to Species of Group A.

1. Dorsum bright red, clavus, a pair of large spots on corium and on
 pronotum black **histrion**
 Dorsum not red and black as the above 2
2. Cuneus red or stained with reddish; membrane hyaline or with
 only a fuscous spot at apex **poecilus**
 Cuneus infuscated or with blackish; membrane having two small
 fuscous points on apical half, or broadly marked with fuscous .. 3
3. Membrane nearly clear but having two small fuscous points, one at
 each side on the apical half **nebulosus**
 Membrane with the apical half heavily infuscated **nubilus**

D. (Camptobrochis) nebulosus Uhler.

Camptobrochis nebulosus Uhler, U. S. Geol. Surv. Terr., Mont. Prelim.
 Rept., 417, 1872.

18th Rept. State Ent. Minn., 91, 1921.

Length 3.5-3.9 mm., width 1.75-2 mm.; ovate, shining; olivaceo-
 testaceous and darkened with blackish, or fuscous to blackish and
 marked with pale; membrane clear, a pair of small fuscous points
 on the apical half, one each side of the middle.

Predaceous; occurs most frequently on *Quercus macrocarpa*,
 but also on other trees.

New Haven, 18 March, 6 Aug., 1911 (A. B. C.); South Meriden, 27
 Feb. (H. L. J.); Westville, 2 Oct., 1905 (W. E. B.).

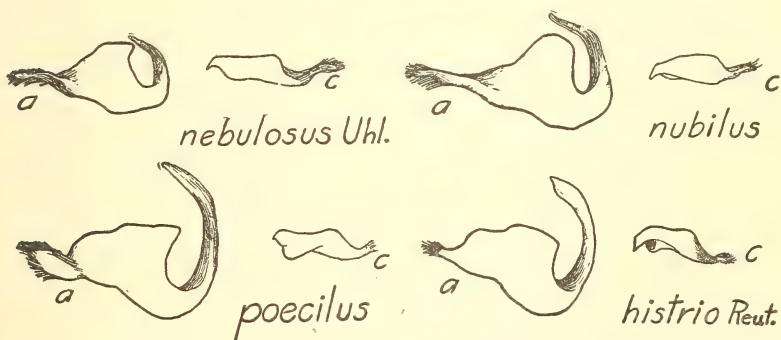


FIG. 50. Male genitalia of *Deraeocoris nebulosus*, *D. nubilus*, *D. poecilus*
 and *D. histrion*,—(a) left clasper, lateral aspect, (c) right clasper, lateral
 aspect, greatly enlarged. Drawing by Dr. H. H. Knight.

D. (Camptobrochis) poecilus McAtee.

Camptobrochis poecilus McAtee, Ent. News, xxx, 246, 1919.

18th Rept. State Ent. Minn., 96, 1921.

Length 4-5 mm., width 2-2.5 mm.; slightly larger than but structurally very close to *nebulosus*; olivaceo-testaceous to brownish and blackish, cuneus red, membrane clear, a rather distinct somewhat oval-shaped fuscous spot on the apex.

Predaceous; occurs most frequently on *Alnus rugosa*.

New Haven, 15 May (A. B. C.); Orange, 21 May (A. B. C.); Portland, 15 May (B. H. W.).

D. (*Camptobrochis*) *histrion* Reuter.

Callicapsus histrion Reuter. Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 75, 1876.

18th Rept. State Ent. Minn., 100, 1921.

Length 4.5-5 mm., width 2-2.3 mm.; dorsum bright red, clavus, pair of large spots on corium and on pronotum black.

Frequents borders of ponds; probably predaceous.

Long Island, N. Y.

***D. (*Camptobrochis*) *nubilus* Knight.**

18th Rept. State Ent. Minn., 106, 1921.

Length 4.2-4.8 mm., width 2-2.3 mm.; male more elongate than female, apical half of membrane usually heavily infuscated; disk of pronotum fuscous to blackish behind the calli, the median line pale; femora biannulate with pale on the apical half.

Occurs on *Pinus strobus*; probably predaceous.

Portland, May (B. H. W.); Rainbow, 13 June (B. H. W.).

Key to Species of Group B.

1. Tibiae banded with fuscous or pale 2
Tibiae uniformly pale or yellowish 7
2. Membrane with a distinctly rounded fuscous spot on the apical half, frequently connected at base by a fuscous streak extending down from between the areoles, thus leaving a large pale spot each side of middle and bordering apex of cuneus 3
Membrane usually somewhat infuscated but not as described above 4
3. Calli solid black, a broad piceous ray behind each, in pale specimens the calli may be somewhat brownish but in such case the median line and margins of the disk are distinctly pale, leaving a dark brown ray behind each callus; hemelytra with piceous on clavus and corium, embolium pale **borealis**
Calli more or less invaded with brownish or pale, distinct rays not apparent behind calli; hemelytra and pronotum more uniformly colored, either fulvo-testaceous or dark brownish **fasciolus**
4. Rostrum extending slightly beyond the posterior margins of the hind coxae; membrane with the apical half scarcely infuscated, femora pale but with two distinct blackish bands near the apex, hind tibiae biannulate with fuscous on the basal half **grandis**
Rostrum scarcely attaining the posterior margins of the hind coxae; membrane, femora, and hind tibiae not having the above combination of characters 5
5. Femora uniformly dark on the apical half, likewise the basal part in darkest specimens; venter distinctly reddish, sometimes dark chestnut red, shining **betulae**
Femora with the apical half distinctly banded or entirely pale 6
6. Second antennal segment with prominent pale exserted hairs, in length equal to three times the thickness of the segment; pronotum

- tum with discoidal margins pale, calli and posteriorly on disk black, forming a ray behind each callus and thus leaving the median line pale **alnicola**
- Second antennal segment without prominent exerted hairs, or if present, not equal to more than twice the thickness of the segment; pronotal disk without distinct rays, sometimes black but the lateral margins not distinctly paler **aphidiphagus**
7. (1) Hind femora with two brown or fuscous bands near the apex; apical half of membrane with a distinctly rounded fuscous spot, usually connected at base by a fuscous streak which extends up between the large areoles 8
- Hind femora with but one fuscous band; apical half of membrane pale or clouded with fuscous but the fuscous area not forming a rounded spot on the apical half 9
8. Calli solid black, a broad piceous ray behind each, in pale specimens the calli may be somewhat brownish but in such case the median line and margins of disk are distinctly pale, leaving a dark brown ray behind each callus, hemelytra with piceous on clavus and corium, embolium pale **borealis**
- Calli more or less invaded with brownish or pale, distinct rays not apparent behind calli; hemelytra and pronotum more uniformly colored, fulvo-testaceous to dark brownish **fasciolus** var. **castus**
9. Dorsum uniformly brownish black; calli and scutellum blackish similar to the whole dorsum **davisi**
- Dorsum pale to testaceous and brownish, frequently becoming fuscous or blackish but always with some pale; calli margined with black or entirely black 10
10. Calli black only around the margin, dorsum rich brownish to fuscobrownish, shining **nitenatus**
- Calli entirely black, or if not, then the dorsum pallid testaceous and with three pustulate fuscous spots, one at apex, middle, and base of each hemelytron 11
11. Dorsum fuscous to blackish, usually with a pale median line running over the disk and scutellum, hemelytra darkened to such an extent that three pustulate fuscous spots are not apparent **quercicola**
- Dorsum pallid testaceous with three pustulate fuscous spots, one at base, middle, and apex of each hemelytron; calli usually black but in pale specimens only margined with black **quercicola** var. **pallens**

D. borealis Van Duzee.

Camptobrochys borealis Van Duzee, Proc. Cal. Acad. Sci., ser. 4, ix, 354, 1920.

18th Rept. State Ent. Minn., 120, 1921.

Length 6-7 mm., width 2.85-3 mm.; elongate, largely pale and marked with piceous; calli deep black, a broad piceous ray behind each, thus leaving the median line and margins of the disk pale or testaceous; embolium pale translucent, membrane with a distinctly rounded fuscous spot on the apical half, usually connected at base by a fuscous streak extending down from between the areoles.

North Branford, 5 July, 1921 (P. G.); South Meriden, 6 July (H. L. J.).

D. fasciolus Knight.

18th Rept. State Ent. Minn., 123, 1921.

Length 6.5 mm., width 2.8-3.1 mm.; usually slightly smaller than *borealis*, disk of pronotum more uniformly colored, calli more

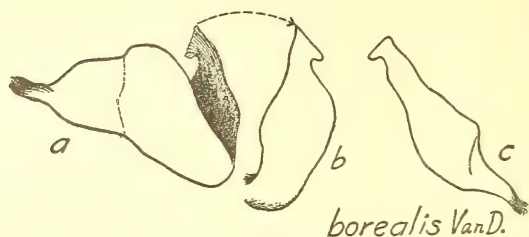


FIG. 51. *Deraeocoris borealis* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

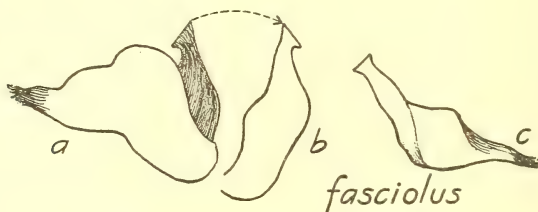


FIG. 52. *Deraeocoris fasciolus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

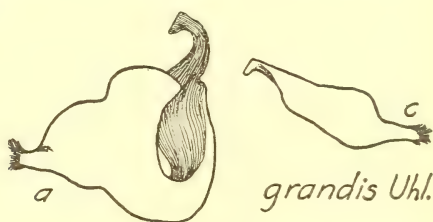


FIG. 53. *Deraeocoris grandis* Uhler,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

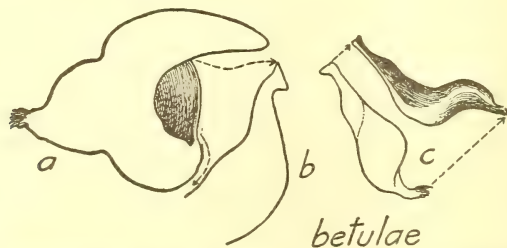


FIG. 54. *Deraeocoris betulae* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, dorsal and lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

or less invaded with brownish or pale and without distinct rays behind; left genital clasper very similar to that of *borealis* but the right clasper is distinctive (fig. 52).

Massachusetts, Maine, New York.

D. fasciolus var. **castus** Knight.

18th Rept. State Ent. Minn., 125, 1921.

Apparently only a color form of *fasciolus*; tibiae pale without annulations, dorsum fulvo-testaceous, calli usually lined with black but sometimes entirely brownish.

Occurs on beech (*Fagus grandiflora*); predaceous on *Phyllaphis fagi* Linnaeus.

Massachusetts, New York.

D. grandis (Uhler).

Camptobrochis grandis Uhler, Ent. Amer., ii, 230, 1887.

18th Rept. State Ent. Minn., 126, 1921.

Length 6.4-7 mm., width 2.9-3.1 mm.; distinguished by the long rostrum which reaches upon the second segment of the venter; dorsum rather uniformly dark brown, median line of pronotal disk rather broadly but only slightly paler than behind the calli; legs pale, apical half of hind femora and basal half of tibiae biannulate with blackish; membrane uniformly pale fumate on the apical half.

Occurs on hickory (*Carya* sp.).

Massachusetts, New York.

***D. betulae** Knight.

18th Rept. State Ent. Minn., 129, 1921.

Length 6.7-7 mm., width 3-3.2 mm.; brown to dark brown or blackish, venter dark reddish brown to chestnut red; femora uniformly blackish on the apical half, tibiae triannulate with blackish.

Occurs on birch (*Betula lutea*).

New Haven, 2 July (W. E. B.); South Meriden, 4 July (H. L. J.).

***D. alnicola** Knight.

18th Rept. State Ent. Minn., 132, 1921.

Length 6.5 mm., width 2.7-2.9 mm.; general aspect very suggestive of *borealis* but distinguished by the genital claspers, prominent exserted hairs on antennae, and by paler infuscation of the membrane which does not form a distinctly rounded spot on the apical half (fig. 55).

Occurs on alders (*Alnus incana*).

New Haven, 20 June (B. H. W.), 2 July (W. E. B.); Stonington, 5 July, (I. W. D.); Wallingford, 19 June, 1912 (D. J. C.).

***D. aphidiphagus** Knight.

18th Rept. State Ent. Minn., 134, 1921.

Length 5.8-6.1 mm., width 2.9-6.1 mm.; fusco-grayish to blackish, the paler and translucent parts not stained with brownish, apical half of membrane infuscated, tibiae triannulate with

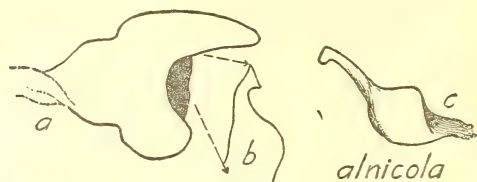


FIG. 55. *Deraeocoris alnicola* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

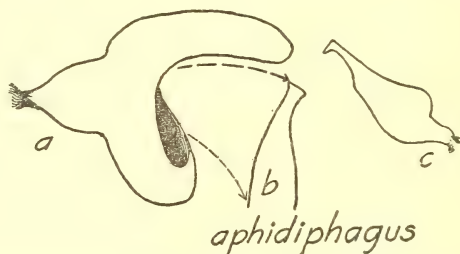


FIG. 56. *Deraeocoris aphidiphagus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

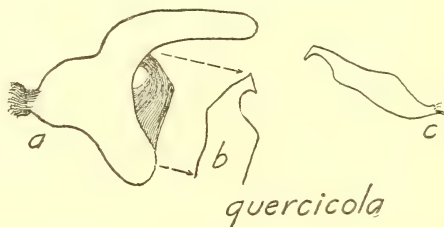


FIG. 57. *Deraeocoris quercicola* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

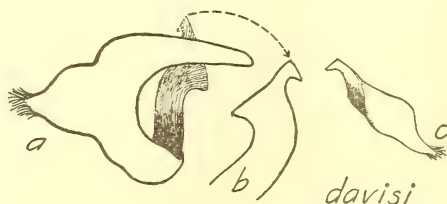


FIG. 58. *Deraeocoris davisi* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

blackish; left genital clasper with a long horn at the dorsal extremity, internal arm slender (fig. 56).

Predaceous on *Eriosoma americanum* Riley.

Wallingford, 13 June, 1911 (J. K. L.); Lyme, June (T. L. Guyton).

***D. quercicola** Knight.

18th Rept. State Ent. Minn., 138, 1921.

Length 5.5-5.8 mm., width 2.4-2.8 mm.; darker colored than *nitenatus*, fuscous to blackish, calli black, apical half of membrane fumate, rarely so pale as in *nitenatus*; left genital clasper with a long dorsal horn which is very distinctive when taken in consideration with the form of the internal arm (fig. 57).

Occurs on *Quercus alba*.

East River, June, 1910 (C. R. E.); New Haven, 8 July (W. E. B.), 7 July, 1920 (B. H. W.).

D. quercicola var. **pallens** Knight.

18th Rept. State Ent. Minn., 140, 1921.

In structure and size similar to *quercicola*; calli more or less pale, pronotal disk rather uniformly colored; scutellum pale, rarely with some blackish each side of median line; hemelytra pale to yellowish, corium with a spot at middle, small one at base, and irregularly at apex, blackish.

Occurs on *Quercus macrocarpa*.

New York.

D. davisii Knight.

18th Rept. State Ent. Minn., 140, 1921.

Length 5.3 mm., width 2.5 mm.; slightly smaller than *nitenatus*, uniformly brownish black; legs and antennae chiefly pale, hind femora with an incomplete dark annulus on apical half; membrane with apical half very faintly but uniformly stained with brownish, veins and areoles darkened with brownish; closely related to *quercicola* but the internal arm of left clasper more highly developed (fig. 58).

Staten Island, N. Y.

D. nitenatus Knight.

|| *Camptobrochis nitens* Reuter, Acta Soc. Sci. Fenn., xxxvi (2), 56, 1909.

18th Rept. State Ent. Minn., 141, 1921.

Length 5.7-6 mm., width 2-2.9 mm.; general aspect very similar to *quercicola* but more highly polished, calli black around the margins only; dorsum rich brownish to dark brownish and piceous, frequently brownish on scutellum but rarely blackish each side of median line; brachium and apices of areoles dark fuscous while the apical half of membrane is practically clear; male genital claspers distinctive of the species (fig. 59).

Predaceous on *Eriosoma lanigerum*.

New Haven, 3 Aug., 1920 (W. E. B.).

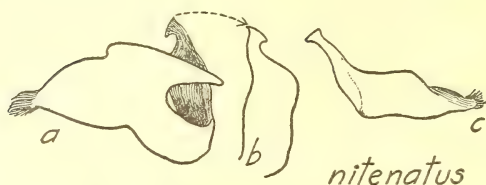


FIG. 59. *Deraeocoris nitenatus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Key to Species of Group C.

1. Dorsum heavily pubescent or hairy, at least with long hairs at anterior angles of the pronotum 5
Dorsum practically glabrous, at most only sparsely and finely pubescent (not rubbed specimens), rarely with a few hairs at anterior angles of pronotum 2
2. Form broad oval, strongly convex (width greater than or equal to at least one-half the length of the insect) (western species)
Form elongate (width not equal to one-half the length) 3
3. Antennae (female) with prominent exerted hairs on segment ii, in length equal to three times the thickness of segment at middle; male segment ii as thick at the middle as on the apical half, length of exerted hairs equal to one and one-half times the thickness of the segment *laricicola*
Antennae (female) with exerted hairs, in length scarcely equal to twice the thickness of the segment where they occur; male segment ii slender on the basal half, distinctly thicker on the apical half than at middle, or if not, then the length of exerted hairs not greater than the thickness of the segment 4
4. Calli margined or lined with black, rarely entirely black, ivory white just before and extending inward from the anterior angles in one or two curved lines upon disk of each callus; male segment ii of antennae nearly as thick at middle as on the apical half, length of exerted hairs scarcely as great as the thickness of the segment *pinicola*
Calli solid black; segment ii very similar in both sexes, slender on the basal half and gradually becoming thicker toward the apex. Exserted hairs about equal to thickness of the segment; scutellum uniformly brownish; hind tibiae broadly pale on apical half but without a pale indication below the knee *appalachianus*
5. (1) Legs uniformly dark sepia brown or blackish, hind tibiae frequently with a pale annulus on the apical half 6
Legs and general body coloration fusco-grayish to blackish; hind femora pale on the basal half, two or three linear series of dark spots visible, apical half dark fuscous to blackish but divided by a narrow pale annulation *kennicotti*
6. Pronotum, hemelytra and legs uniformly dark sepia brown or blackish, the semitranslucent areas stained with brownish; hind tibiae usually distinctly annulated with pale on the apical half .. *nigritulus*
Pronotum usually fusco-grayish or black; hemelytra fuscous to black, becoming paler in certain areas but not stained with brownish; legs brownish black, hind tibiae sometimes indistinctly annulated with paler on the apical half; front coxae, xyphus, lower margins of propleura, gula, and sides of tylus, pale *albigulus*

***D. pinicola** Knight.

18th Rept. State Ent. Minn., 162, 1921.

Length 5.7-6 mm., width 2.6-2.9 mm.; calli margined or lined with black, antero-lateral angles invaded with pale, median line of front and just before calli pale to ivory-white; general coloration pale to grayish and darkened with blackish, not at all tinged with brownish (fig. 60).

Occurs on *Pinus strobus*; predaceous on *Chermes pinicorticis* Fitch.

Hartford, July (M. P. Z.); Killingworth, 27 June, 1920 (W. E. B.); New Haven, 16 June (M. P. Z.), 11 July (W. E. B.).

D. laricicola Knight.

18th Rept. State Ent. Minn., 164, 1921.

Length 6-6.5 mm., width 2.7-2.8 mm.; very suggestive of *pinicola* but slightly larger and more elongate, differs in the prominent exerted hairs on antennae and in the structure of the genital claspers (fig. 61).

Occurs on larch (*Larix laricina*).

Massachusetts, New York.

D. kennicotti Knight.

18th Rept. State Ent. Minn., 166, 1921.

Length 5.7-6.8 mm., width 2.7-2.8 mm.; very much resembling and closely related to *laricicola* but having the dorsum distinctly hairy; structure of the male genital claspers very distinctive (fig. 62).

Maine.

D. nigrutilus Knight.

|| *Camptobrochis nigrita* Reuter, Acta Soc. Sci. Fenn., xxxvi, No. 2, 55, 1909.

18th Rept. State Ent. Minn., 170, 1921.

Length 5.9-6.4 mm., width 2.9-3.1 mm.; subovate, hemelytra only very slightly convex, dorsum distinctly hairy, legs thickly clothed with long erect hairs; dark sepia brown to blackish, the subtranslucent parts stained with brownish (fig. 63).

Occurs on *Pinus virginiana*.

Maryland.

D. albigulus Knight.

18th Rept. State Ent. Minn., 171, 1921.

Length 6.5-7.1 mm., width 2.9-3.1 mm.; closely related to *nigrutilus* but differs slightly in coloration and in structure of the male genital claspers; dark fuscous to black, basal half of hemelytra more or less pale between punctures, the paler areas not stained with brownish; front coxae, xyphus, lower margins of propleura, ostiolar area, gula, sides of tylus, juga, and arcuated streak just above on each side of front, pale (fig. 64).

Occurs on *Pinus sylvestris* and *P. resinosa*.

New York.

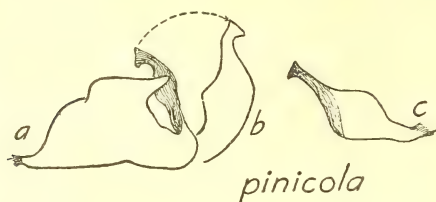


FIG. 60. *Deraeocoris pinicola* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

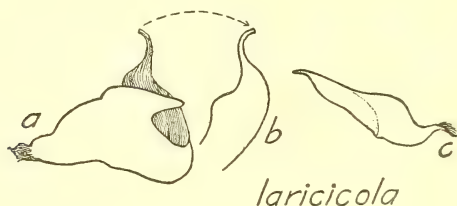


FIG. 61. *Deraeocoris laricicola* Knight,—male genital claspers, (a) left clasper, lateral aspect (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

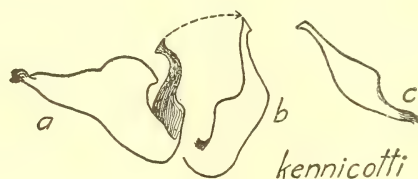


FIG. 62. *Deraeocoris kennicotti* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

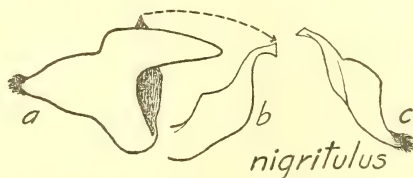


FIG. 63. *Deraeocoris nigrutilus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Key to Species and Varieties of Group D.

1. Scutellum pale or red 2
 Scutellum black, or only the median line pale apically 5
2. Lateral margins of pronotum black, or only narrowly pale at anterior angles 3
 Lateral margins of pronotum broadly pale or reddish 4
3. Front of head pale to reddish typical *sayi*
 Front of head distinctly blackish *sayi* var. *frontalis*
4. Embolium black like the corium *sayi* var. *marginatus*
 Embolium pale and the cuneus more or less translucent *sayi* var. *costalis*
5. Femora black, distinctly annulated with pale near apices *sayi* var. *unicolor*
 Femora distinctly pale on basal half, broadly annulated with black at middle of apical half *sayi* var. *femoralis*

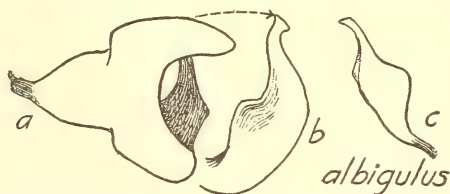


FIG. 64. *Deraeocoris albigulus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

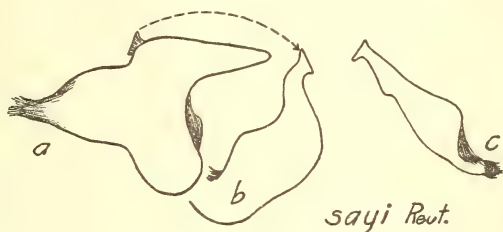


FIG. 65. *Deraeocoris sayi* Reuter,—male, genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

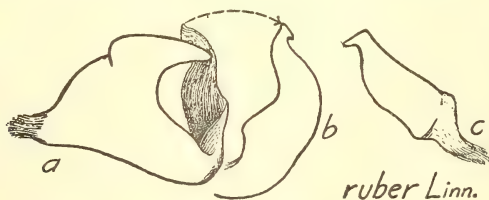


FIG. 66. *Deraeocoris ruber* Linnaeus,—male genital claspers, (a) left clasper, lateral aspect, (b) internal arm of left clasper, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

D. sayi (Reuter), typical.

Enarmosus sayi Reuter, Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 76, 1876.
18th Rept. State Ent. Minn., 175, 1921.

Length 7.4-7.9 mm., width 3.4-3.8 mm.; distinctly hairy; black, scutellum and front of head pale to reddish (fig. 65).

Occurs on oak (*Quercus* sps.).

New York.

D. sayi var. *costalis* Knight.

18th Rept. State Ent. Minn., 177, 1921.

Similar to the typical *sayi* but differs as indicated in the key; hemelytra with costal margin and cuneus largely pale, lateral margins of pronotal disk also pale.

Massachusetts.

Key to Species and Varieties of Group E.

- | | | |
|----|--|------------------------------------|
| 1. | Head except tylus, pronotum, scutellum, and hemelytra except apex of cuneus, reddish | typical ruber |
| | Hemelytra or pronotum, or both, more or less blackish | 2 |
| 2. | Hemelytra reddish, pronotal disk black or largely blackish | ruber var. bicolor |
| | Hemelytra and pronotum more or less blackish | 3 |
| 3. | Pronotal disk largely, scutellum, corium and embolium except apically, reddish | ruber var. danicus |
| | Pronotum, scutellum, hemelytra except narrowly at base of embolium and corium, black | 4 |
| 4. | Cuneus reddish on the basal half | ruber var. segusinus |
| | Cuneus entirely black | ruber var. concolor |

D. ruber Linnaeus, typical.

Cimex ruber Linnaeus, Syst. Nat., Edn. 10, 446, 1758.

18th Rept. State Ent. Minn., 191, 1921.

Length 7.2 mm., width 3.4 mm.; tylus strongly compressed, outline of head appearing nearly triangular when viewed from above; antennal segment ii slender on basal half but thickened apically; head except tylus, pronotum, scutellum, and hemelytra except of cuneus, reddish; membrane infuscated (fig. 66).

Predaceous on plant lice (Aphididae).

New Haven, June (B. H. W.); Stamford, 24 June, 1919 (E. D. Brown).

**D. ruber* var. *bicolor* Knight.

18th Rept. State Ent. Minn., 193, 1921.

Similar to the typical variety except that the pronotum is black; sometimes the lateral margins of the disk and the slender median line reddish.

Hartford, 26 June (W. Marchand); New Haven, 30 June, 1 July (M. P. Z.).

D. ruber var. *danicus* Fabricius.

Lygaeus danicus Fabricius, Ent. Syst., iv, 181, 1794.

18th Rept. State Ent. Minn., 193, 1921.

Head reddish, tylus and a mark extending from dorsal margin

of eye to the collum, black; pronotum reddish, becoming black on the basal half but not covering the basal angles; scutellum and hemelytra reddish, clavus and rather broadly across apical end of corium blackish; cuneus red, the apical one-third black; legs and ventral surface similar to those of the typical form.

New Haven, 12 July (M. P. Z.).

D. ruber var. segusinus Müller.

Cimex segusinus Müller, Manip. Ins. Taur., 191, 1766.

18th Rept. State Ent. Minn., 193, 1921.

Black, front of head, base of corium and embolium, and basal half of cuneus, reddish; ventral surface of body black, ostiolar peritreme pale; legs colored as in the typical variety or only slightly darker.

New Haven, 21 July (M. P. Z.).

Subfamily ORTHOTYLINAE.

Key to Tribes.

1. Eyes pedunculate, head very broad (p. 501) **Labopini**
 Eyes not pedunculate, head not unusually broad 2
2. Pronotum with pleural area separated from dorsal part by a distinct suture; pronotal disk raised posteriorly and projecting above the scutellum; clothed with dense erect, bristly pubescence
 (p. 498) **Semiini**
 Pronotum not separated by a distinct lateral suture; base of pronotal disk not projecting above scutellum 3
3. Body robust, short oval or ovate, femora saltatorial; head strongly vertical, width of vertex greater than length of head when seen from above (p. 498) **Halticini**
 Body usually elongate; length of head usually greater than width of vertex, if not then the head not sharply vertical, or the thorax sulcate-sinuate at the sides 4
4. Antennal segment iii equally thick as segment ii, or nearly so 5
 Antennal segment iii distinctly more slender than segment ii 6
5. Thorax campanulate, apex of pronotum scarcely greater than width of vertex; slender species, hemelytra medially coarctate, abdomen slender at base; females usually brachypterous, abdomen very broad but narrowed at base (p. 545) **Systellonotini**
 Thorax not distinctly campanulate, apex of pronotum wider than vertex; sometimes slender but in such case the hemelytra not medially coarctate, the abdomen broad at base; females frequently brachypterous but abdomen not at all narrowed at base
 (p. 524) **Ceratocapsini**
6. Slender ant-like species, especially in the shape of the head; sides of pronotum more or less sulcate-sinuate, or greatly narrowed on the apical half; usually with silver markings composed of deciduous scale-like hairs (p. 537) **Pilophorini**
 Form not ant-like; sides of pronotum not sulcate-sinuate; devoid of silver markings like the above 7
7. Head strongly produced vertically; genae high, usually as great as the height of an eye, but if not then the front above the tylus is prominent when seen from above, the outline of front describing a sinuate arc between the eyes, the width of vertex being greater than length of head (p. 501) **Lopidini**

Head not so strongly produced vertically; genae medium or low, not equal to the height of an eye; head usually as long or longer than the width of vertex (p. 509) **Orthotylini**

Tribe SEMIINI.

Semium Reuter.

S. hirtum Reuter.

Ofv. Kongl. Sv. Vet.--Akad. Förh., xxxii, No. 9, 80, 1876.

Length 2.8 mm., width 1 mm.; legs and antennae red; head, apex of pronotum and sides of thorax rosy red; basal half of pronotum, clavus, bar across apex of corium, and tip of cuneus, velvety brown, remaining parts of corium and cuneus white; densely clothed with erect bristly pubescence.

Occurs on *Euphorbia adenoptera*, living on the red underside of the leaves.

New Jersey.

Tribe HALTICINI.

Key to Genera.

1. Head with well defined sharp basal margin; black forms 2
 Head without a well defined sharp basal margin; head and dorsum thickly clothed with closely appressed scale-like hairs and interspersed with more erect long pubescent hairs; small species, variously colored but never black (p. 498) **Parthenicus**
2. Antennae very long and slender, segment ii four or more times longer than segment i; brachypterous forms common; oval, strongly convex (p. 499) **Halticus**
 Antennae shorter, segment ii little more than three times the length of segment i; usually larger and more oblong forms 3
3. Antennae with short fine pubescence, head and body nearly glabrous, shining black (p. 500) **Strongylocoris**
 Antennae and head with long coarse black hairs; length of hairs on antennal segment iii equal to three times the thickness of segment (p. 500) **Orthocephalus**

Parthenicus Reuter.

P. vaccini (Van Duzee).

Pomona Jour. Ent, Zool., vii, 117, 1915.

Female: Length (macropterous) 2.7 mm., width 1.05 mm.; head strongly produced like a *Criocoris*, ecarinate; pale, tinged brown on pronotum and scutellum; dorsum, legs, and antennae speckled with brown, the brown on hind femora darker and with spots joining in patches; thickly clothed with silvery scale-like hairs, becoming golden brown on corium and black on parts of embolium and cuneus, also with much longer pale pubescent hairs on head, margins of pronotum and hemelytra.

Male: Length 3.5 mm., width 1 mm.; very similar to the female but more elongate.

Female: Length (brachypterous) 1.6 mm., width .9 mm.; oval, membrane scarcely extending beyond apex of cuneus and just attaining tip of abdomen; slightly paler but otherwise marked like the typical macropterous form.

Occurs on *Vaccinium*.

Massachusetts, Long Island, New York.

P. juniperi (Heidemann).

Jour. N. Y. Ent. Soc., xiii, 49, 1905.

Male: Length 3 mm., width 1 mm.; pale yellowish, cuneus, apical one-third of corium, and base of head, tinged with reddish, color sometimes separating into specks; femora sprinkled with reddish; scutellum and base of clavus darkened with fuscous; head shorter and more nearly vertical than in *vaccini*; clothed with fine erect, golden pubescence, intermixed with more closely appressed scale-like golden hairs, the latter more silvery on scutellum and transversely across corium at tip of clavus, becoming black across apex of corium and forming a spot on inner edge of cuneus at middle and at base; membrane uniformly infuscated and iridescent.

Female: Very similar to the male in form and color.

Food plant: Red cedar (*Juniperus virginiana*).

Massachusetts, New York.

Halticus Hahn.

H. apterus (Linnaeus).

Cicada aptera Linnaeus, Syst. Nat., Edn. 10, i, 438, 1758.

Reuter, Hem. Gymn. Eur., iv, 18, 161, pl. 1, fig. 5, 1891.

Length 2.7 mm., width 1.5 mm.; black, strongly shining, devoid of scale-like pubescence; usually brachypterous; antennae pale, segments iii and iv lightly infuscated; first two segments of tarsi, tibiae, and apices of femora, pale.

Maine, Canada.

H. citri Ashmead.

Ent. Amer., iii, 155, 1887.

Male: Length 1.9-2 mm., width .7 mm.; black, slightly shining; antennae fuscous, middle of segment ii and base of iii, pale; usually antennal segment i pale also, dark in the female; tarsi and tibiae except base of posterior pair, and apices of femora, pale; clothed with very fine pale pubescence, and with deciduous tomentose patches which give silvery and greenish reflections.

Female: Length (brachypterous) 1.5 mm., width 1 mm.; length (macropterous) 1.9 mm.; usually brachypterous but frequently winged like the male.

Food plants: White clover, beans, *Plantago lanceolata*; also recorded on many other plants.

Kent, 31 Aug., 1904 (W. E. B.); New Haven, 16 Oct., 1903 (H. L. V.); Southport, 9 Sept., 1904 (W. E. B.).

H. intermedius Uhler.

Proc. U. S. Natl. Mus., xxvii, 360, 1904.

Length 3.5 mm., width 2 mm.; black, moderately shining; clothed with fine pale pubescence, the dorsum with deciduous tomentose patches which give silvery or greenish reflections; antennae pale, apex of segment ii and most of iii and iv, fuscous; juga, tibiae, tarsi except apex, and apices of femora, pale.

Food plant: *Clematis virginiana*.

Branford, 28 July, 1905 (H. L. V.).

Strongylocoris Blanchard.

S. stygica (Say).

Compl. Writ., i, 344, 1859.

Length 4.2-4.5 mm., width 1.9-2.3 mm.; black, moderately shining; finely but densely punctured and somewhat rugulose; antennal segment ii pale on middle; apices of femora, tibiae, tarsi except the last segment, base of trochanters, pale yellowish; hind tibiae usually nearly black.

Food plant: *Solidago* spp.

Greens' Farms, 24 June, 1904 (W. E. B.); Killingworth, 27 June, 1920 (W. E. B.); New Haven, 26 June, 1905 (B. H. W.); West Haven, 27 June, 1905 (H. L. V.).

Orthocephalus Fieber.

O. mutabilis (Fallen).

Capsus mutabilis Fallen, Monog. Cim. Suec., 98, 1807.

Reuter, Hem. Gymn. Eur., iv, 48, 165, 166, pl. 4, figs. 2, 3, 1891.

Male: Length 4.8 mm., width 1.7 mm.; black, clothed with long black hairs, especially on the antennae, head, sides of pronotum and hemelytra; in addition to black hairs the dorsum bears rather sparse, short pale tomentose pubescence; inner half of corium and slender margin of clavus bordering claval suture, pale.

Female (macropterous): Length 4.9 mm., width 2.2 mm.; more robust than the male, very similar in color but narrowly pale along claval suture. This form of the female is comparatively scarce.

Female (brachypterous): Length 4.1 mm., width 2.3 mm.; broader and more ovate than the macropterous form; hemelytra not attaining apex of abdomen, membrane absent, uniformly black, claval suture scarcely developed. This is the common female form.

Food plant: *Chrysanthemum leucanthemum* Linnaeus.

Maine, New York.

Tribe LABOPINI.

Labops Burmeister.**L. hirtus** Knight.

Can. Ent., liv, 258, 1922.

Length 5 mm., (brachypterous) 4.3 mm., width 2.4 mm.; easily recognized by the pedunculate eyes, width of head great as width of pronotum at base; black, narrow margin of hemelytra, marks on head, and coxae, pale yellowish to ivory-white; bands about middle and at apices of femora, tibiae excluding apices and knees, yellowish; clothed with coarse, long, erect pubescence.

Maine, Massachusetts, New York.

Tribe LOPIDINI.

Key to Genera.

1. Base of vertex without a ridge bearing bristles 2
Vertex with a high transverse ridge at base, running from eye to eye and bearing bristles; pronotum and hemelytra with sparsely set, erect black bristles (p. 501) **Hadronema**
2. Genae very high, height greater than the depth of an eye; without an oblique suture dividing the genae beneath the eyes; tylus strongly protruding, its base well below the lowest margin of the eye (p. 501) **Ilnacora**
Genae medium or high; with an oblique suture leading from base of antenna to beneath the eye and thus dividing the gena; base of tylus above a line drawn through the lowest margin of the eyes (p. 502) **Lopidea**

Hadronema Uhler.**H. militaris** Uhler.

Hayden's Surv. Terr., Rept. for 1871, 412, 1872.

Length 5-5.4 mm., width 2 mm.; black, outer margin of the hemelytra and cuneus, pale; basal margin, and sometimes basal half of pronotum, reddish; clothed with sparsely set, erect black bristles.

Food plant: *Baptisia tinctoria*.

Long Island, N. Y.

Ilnacora Reuter.**I. malina** (Uhler).

Bull. U. S. Geol. Geog. Surv., iii, 419, 1877.

Length 5.4 mm., width 1.6 mm.; head, body, and antennae mostly black; hemelytra and base of the pronotum bright green, apex of the pronotum, two stripes on scutellum, and legs, greenish yellow; a round black spot behind each callosity; membrane blackish.

Food plant: *Solidago rugosa*, growing in shaded damp places.

Litchfield, 22 July, 1920 (P. G.); Wilton, 24 July, 1920 (M. P. Z.).

I. stalii Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 86, 1876.

Length 5.5 mm., width 1.8 mm.; pale greenish white; dorsum bearing patches of black scale-like hairs, forming a prominent spot behind each callus, one at base of scutellum, and one at inner angle of cuneus.

Occurs on Cocklebur and other weeds.

New York.

Lopidea Uhler.**L. confluens** (Say).

Capsus confluenta Say, Heter. N. Harm., 23, 1832; Compl. Writ., i, 341, 1859.

Ent. News, xxix, 211, 1918.

Male: Length 6.3 mm., width 2.1 mm.; yellowish orange and tinged with reddish, broadly each side of commissure, membrane.

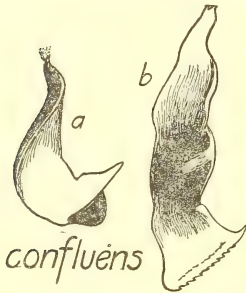


FIG. 67. *Lopidea confluens* Say,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 68. *Lopidea davisi* Knight,—male genital claspers, (a) left clasper, dorsal aspect, (e) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

scutellum, and more or less on pronotal disk, darkened with fuscous; antennae, tylus, rostrum, base of head, and a stripe each side of front, black; legs blackish, trochanters and coxae except basally, yellowish; genital claspers (fig. 67), distinctive of the species.

Female: Length 6.5 mm., width 2.4 mm.; more robust than the male but very similar in coloration.

Breeds on *Polymnia uvedalia*, and probably *P. canadensis*.

Massachusetts, New Hampshire, New York.

L. davisi Knight.

Ent. News, xxviii, 458, 1917.

Male: Length 5.5 mm., width 2 mm.; yellowish orange to reddish; antennae, legs, front of head, and rostrum, black; calli, base

of pronotum, scutellum, clavus, inner half of corium, and membrane, fuscous; genital claspers (fig. 68), distinctive of the species.

Female: Length 5.6 mm., width 2.1 mm.; more robust than the male but very similar in coloration.

When described the food plant of this species was unknown, but in the short interval since that time, the insect has appeared as a serious pest on the cultivated Phlox, in Arkansas, Minnesota, and West Virginia. It may very well be called the "phlox plant bug."

Long Island, N. Y.

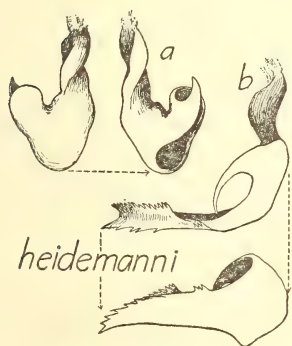


FIG. 69. *Lopidea heidemanni* Knight,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, dorsal aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 70. *Lopidea cuneata* Van Duzee,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, dorsal aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. heidemanni Knight.

Ent. News, xxviii, 456, 1917.

†*Lopidea marginata* Heidemann, Check List, Ins. Conn., 69, 1920.

Male: Length 6.7 mm., width 2.14 mm.; dark red, with more fuscous on pronotum and scutellum than *media*; larger and more elongate than *media*, the hemelytra always exhibiting a strong tendency to shrivel and wrinkle longitudinally; genital claspers distinctive (fig. 69), the right clasper showing a close relationship with *cuneata* and *salicis*.

Female: Length 6.2 mm., width 2.08 mm.; slightly more robust than the male, otherwise very similar; costal margins of hemelytra frequently pale as in *media*; in certain color phases, dull orange red with fuscous.

Breeds on elm (*Ulmus*); nymphs have also been reared from *Achillea millefolium*.

Durham, 15 June, 1919, New Haven, 29 May, 13 June, 1920 (M. P. Z.).

L. cuneata Van Duzee.

Trans. Am. Ent. Soc., xxxvi, 79, 1910.

Male: Length 6.1 mm., width 2 mm.; dorsum dark fuscous on a background of orange-red, cuneus, embolium, and base of radial vein, more strongly reddish; pronotum dark fuscous, lateral margins of disk pale to reddish; antennae, head and legs chiefly, black; mark along front margin of eye, juga, genae, trochanters, and coxae except basally, pale; propleura except surrounding coxal cleft, pale reddish; venter reddish and darkened with fuscous, genital segment blackish; genital claspers (fig. 70), distinctive of the species.

Female: Length 6 mm., width 2.1 mm.; similar to the male but the reddish coloration replaced chiefly by pale, frequently the inner margin and apical angles of corium becoming pale.

Collected on *Populus balsamifera* by Van Duzee, while the writer has found it to breed on *Populus deltoides* in Minnesota.

New York, Illinois, Minnesota.

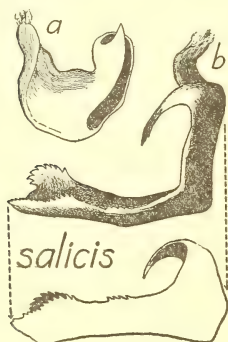


FIG. 71. *Lopidea salicis* Knight, —male genital claspers, (a) left clasper dorsal aspect, (b) right clasper, dorsal aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

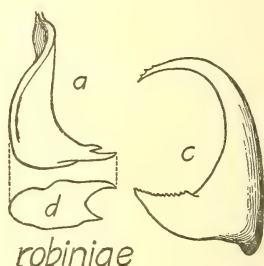


FIG. 72. *Lopidea robiniae* Uhler, —male genital claspers, (a) left clasper, dorsal aspect, (c) right clasper, posterior aspect, (d) left clasper, posterior aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. salicis Knight.

Ent. News, xxviii, 457, 1917.

Male: Length 5.7 mm., width 1.94 mm.; black, propleura and basal angles of pronotal disk orange colored; embolium and cuneus except inner apical margin, yellowish to orange; genital claspers (fig. 71), distinctive of the species.

Female: Very similar to the male in size and coloration, sometimes slightly more robust. Closely related to *cuneata* but differs in the genital claspers and in having more orange color on the pronotum and sides of hemelytra.

Breeds on *Salix nigra*.

New York.

L. robiniae (Uhler). (Plate xvi, 14.)

Capsus robiniae Uhler, Proc. Ent. Soc. Phila., i, 24, 1861.

Ent. News, xxix, 211, pl. 13, fig. 2, 1918.

Male: Length 6.8 mm., width 2.1 mm.; color orange-yellow, dorsum infuscated similarly to *confluens*; distinguished from the pale forms of *confluens* only by the genital claspers (fig. 72).

Female: Length 6.5 mm., width 2.14 mm.; usually slightly more robust than the male but very similar in coloration.

Breeds on *Robinia pseudacacia*.

Branford, 29, July, 1905 (H. W. W.); New Haven, 11 July, 1920 (B. H. W.), 3 Aug., 1905 (H. L. V.); Stratford, 9 July, 1920 (B. H. W.); Westville, 27 July, 1905 (W. E. B.).

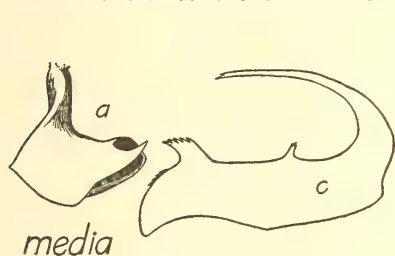


FIG. 73. *Lopidea media* Say,—male genital claspers, (a) left clasper, dorsal aspect, (c) right clasper, posterior aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

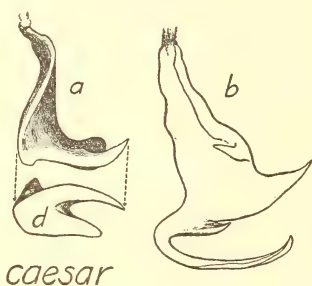


FIG. 74. *Lopidea caesar* Reuter,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, internal lateral aspect, (d) left clasper, posterior aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. media (Say).

Capsus media Say, Heter. N. Harm., 22, 1832; Compl. Writ., i, 341, 1859.

Ent. News, xxix, 210, pl. 13, fig. 1, 1918.

Male: Length 5.6 mm., width 1.7 mm.; orange-red to bright red, scutellum and rather broadly either side of commissure, darkened more or less with fuscous, the reddish always showing through the infuscation; legs fusco-brownish to blackish, femora exhibiting one or two rows of darker spots both above and below; genital claspers (fig. 73), very distinctive of the species.

Female: Length 5.7 mm., width 1.8 mm.; usually colored very similarly to the male but sometimes with the embolium and outer edge of cuneus pale or white as in *heidemanni*.

Breeds on *Solidago rugosa*, and probably other plants.

New Haven, 9 June, 1905 (B. H. W.); Portland, 14 July, 1914 (M. P. Z.); Rainbow, 30 June, 1914 (B. H. W.); South Meriden, 6 July, 1914 (H. L. J.); Woodbury, 14 July, 1913 (W. E. B.).

L. caesar (Reuter).

Lomatopleura caesar Reuter, Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 67, 1876.

Ent. News, xxix, 212, pl. 13, fig. 4, 1918.

Male: Length 7 mm., width 2.2 mm.; color deep carmine red, darkened with fuscous on scutellum and more or less broadly each side of commissure; front of head, base of vertex, antennae, and membrane dark fuscous to black; legs and venter dark fuscous through which a tinge of red is apparent; genital claspers (fig. 74), distinctive of the species. Antennae: Segment i, length .80 mm., width .10 mm.; ii, 2.8 mm., thickness .09 mm., tapering on apical half to more slender at apex, black and rather thickly clothed with recumbent coarse hairs as in segment i; iii, 1.66 mm., slender, finely pubescent; iv, .64 mm., more slender than iii.

Female: Length 7.9 mm., width 2.66 mm.; color and structure of antennae similar to that of the male.

Guilford, 13 July, 1920 (B. H. W.); Portland, 14 July, 1914 (M. P. Z.), 10 Aug., 1913 (B. H. W.).

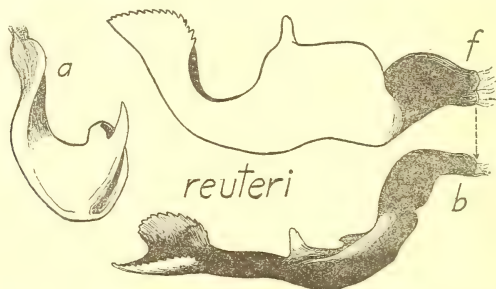


FIG. 75. *Lopidea reuteri* Knight,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, dorsal aspect, (f) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. reuteri Knight.

Ent. News, xxviii, 459, fig. 5, 1917.

Male: Length 7.1 mm., width 2.54 mm.; color a vivid carmine red, fuscous on calli, scutellum, and bordering the commissure; very similar to *caesar* but not so broadly fuscous on corium and cuneus; genital claspers (fig. 75) distinctive of the species. Antennae: Segment i, length .65 mm., thickness .17 mm.; ii, 2.42 mm., greatest thickness .14 mm., tapering from middle to more slender at apex; iii, 1.6 mm., linear and slender; iv, .60 mm.; black, first two segments clothed with prominent coarse hairs; almost identical in structure to *caesar*.

Female: Length 6.9 mm., width 2.5 mm.; structurally and in color very similar to the male; very similar to the female of *caesar* which species rarely has the calli darkened and usually has less fuscous shading on the scutellum.

Breeds on witchhazel (*Hamamelis virginiana*).

Massachusetts, New York, Pennsylvania.

L. staphyleae Knight.

Ent. News, xxviii, 460, fig. 4, 1917.

Male: Length 6.5 mm., width 2.05 mm.; orange-yellow, fuscous on calli, narrowly at base of pronotum, scutellum, apical two-thirds of clavus, inner half of corium, and membrane; antennae, tylus, two bars on front, base of head, rostrum, and legs, black; the fuscous shading on the dorsum much paler than in *robiniae*; genital claspers (fig. 76), distinctive of the species. Antennae: Segment i, length .71 mm., thickness .15 mm.; ii, 2.48 mm., thickness .10 mm., tapering slightly smaller on apical half; iii, 1.82 mm., slender and almost linear; iv, .52 mm.

Female: Length 6.8 mm., width 2.2 mm.; similar to the male in structure and coloration, but usually slightly larger. Sometimes very similar in size and coloration to the female of *confluens*; but the length of antennal segment i in *confluens* is shorter than the width of vertex, while in *staphyleae* its length is as great as, or slightly longer than, the width of vertex.

Food plant: American bladder nut (*Staphylea trifolia*).

New York.

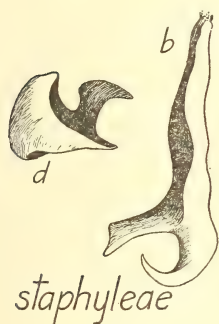


FIG. 76. *Lopidea staphyleae* Knight,—male genital claspers, (b) right clasper, dorsal aspect, (d) left clasper, posterior aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

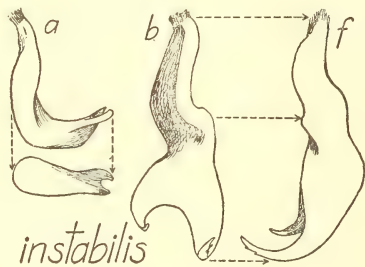


FIG. 77. *Lopidea instabilis* Reuter,—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, dorsal aspect, (f) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

***L. staphyleae** var. *sanguinea* Knight.

Ent. News, xxviii, 461, 1917.

Male: Size, structure of the antennae and male genital clasper not differing appreciably from the typical *staphyleae*, but the yellow coloration replaced by bright red.

Female: Similar to the male in structure and coloration; very much resembling the females of *reuteri* and *caesar*, but the more slender form of the antennae will serve to distinguish this variety.

In Minnesota the writer has taken a large series of this variety

on *Staphylea trifolia* but not a single specimen of the typical species.

Mount Carmel, 24 July, 1904 (W. E. B.).

L. instabilis (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 72, 1909.

Male: Length 5.4 mm., width 2.02 mm.; bright red, apical half of clavus and inner half of corium darkened with fuscous; membrane uniformly blackish; tibiae blackish, becoming reddish at base; genital claspers distinctive (fig. 77). Antennae: segment i, length .58 mm., thickness .08 mm.; ii, 1.8 mm., greatest thickness (.07 mm.) at middle and tapering to smaller at each end; iii, 1.19 mm., slender; iv, .52 mm.; black, first two segments clothed with moderately short black hairs.

Female: Length 6 mm., width 2.4 mm.; similar to the male in coloration and in structure of the antennae.

District of Columbia, Maryland.

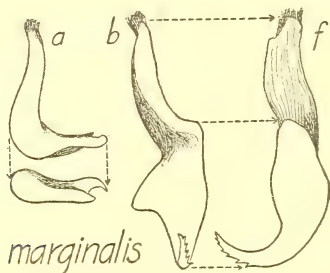


FIG. 78. *Lopidea marginalis* Reuter.—male genital claspers, (a) left clasper, dorsal aspect, (b) right clasper, dorsal aspect, (f) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. marginalis (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 72, 1909.

Male: Length 6 mm., width 2.2 mm.; very similar in form and coloration to *instabilis* but usually with the embolium pale and the scutellum darkened with fuscous; genital claspers distinctive of the species (fig. 78). In some specimens the embolium may be bright red as in *instabilis*, but usually the scutellum, calli, and base of head are distinctly blackish.

Female: Length 6.6 mm., width 2.5 mm.; very similar to the male in structure and in coloration.

This form was originally described as a variety of *instabilis* but proves on examination of the genital claspers to be a distinct species.

New Haven, 7 Aug., 1905 (W. F. B.).

Tribe ORTHOTYLINI.*Key to Genera.*

1. Pronotal disk transversely sulcate behind the calli and extending over the sides; calli distinctly arched, separated by a depression
Pronotal disk without transverse sulcus; calli not so distinctly arched 2
2. Length of antennal segment i never exceeding width of vertex plus an eye; female with antennal segment ii distinctly thickened apically, usually brachypterous; black species with paler markings (p. 510) **Globiceps** 3
- Length of antennal segment i nearly equaling width of head, thicker on basal half and tapering apically; antennal segment ii linear in both sexes; green species [Blepharidopterus]
3. Pronotal disk immarginate although sometimes forming a rather sharp angle; antennal segment ii linear; vertex scarcely margined and never fitting closely against front margin of pronotum 4
- Pronotal disk margined at sides; antennal segment ii incrassate, fusiform, segment iii thickened but more slender than ii; vertex strongly margined, fitting closely against anterior margin of pronotum; clothed with closely appressed, scale-like pubescence, and intermixed with erect fine hairs (p. 524) **Heterocordylus**
4. Antennal segment i with black line on each side, and connected beneath near apex; eyes elongate as seen from above, their inner margins parallel; color white or greenish, clothed with rather long white pubescence (p. 523) **Reuteria**
- Antennal segment i never marked with longitudinal black lines; eyes not so elongate when seen from above, their inner margins diverging 5
5. Head inclined, when viewed from the side not or scarcely projecting below base of head; sexes similar 6
- Head vertical, strongly compressed apically, when seen from the side, projecting below base of head for a distance equal to one-half its height at base; pronotum sinuate at base and slightly so at the sides; male and female very dissimilar; female short winged, the abdomen very broad, macropterous forms rare
(p. 510) **Mecomma**
6. Head not distinctly compressed apically, vertex margined although sometimes ecarinate; width of pronotum distinctly greater than width of head; vertex when black, never with a pale spot at each side 7
- Head strongly compressed apically, vertex immarginate, declivitous behind; basal width of pronotum very little greater than width of head; usually a small pale spot each side of vertex
(p. 511) **Cyrtorhinus**
7. Eyes set close to pronotal angles and nearly forming a straight line with base of vertex 8
- Eyes rounded behind, thus bringing the center of eyes near middle of head and away from pronotal angles. Small, delicate, translucent pale green species (p. 522) **Diaphnidia**
8. Xyphus moderately sulcate, sides V-shaped; rostrum extending beyond hind margin of mesosternum; pubescence frequently of two types, but in such case the rostrum extends beyond mesosternum; vertex carinate but sometimes rather obtusely so, never beset with bristly hairs (p. 511) **Orthotylus**
- Xyphus deeply excavated, sides U-shaped and elevated into a high carina; rostrum scarcely attaining hind margin of mesosternum; pubescence composed of two kinds of hairs, a closely appressed

scale-like type and interspersed with more erect pubescent hairs; vertex ecarinate but basal margin beset with bristly hairs, an alutaceous glabrous spot each side bordering eye; general aspect very similar to certain species of *Phytocoris*

(p. 523) *Noctuocoris* n. gen.

Globiceps Le Peletier and Serville.

G. dispar (Boheman).

Cyllocoris dispar Boheman, Ofv. Kongl. Vet.-Akad., ix, 72, 1852.

Reuter, Hem. Gymn. Eur., iii, 397, pl. 3, fig. 1, 1883.

Saunders, Hem. Het. Brit. Isds., 281, 1892.

Male: Length 4.3 mm., width 1.14 mm.; black, vertex with pale spot at each side; hemelytra fuscous but translucent, base of corium, somewhat invading clavus, and cuneus except dusky apex, pale translucent; membrane pale fuscous, veins slightly darker; legs and basal half of antennal segment i, yellowish, tarsi and hind tibiae dusky; calli distinctly convex or gibbus, margins of pronotal disk sharply flaring at basal angles.

Female (macropterous): Length 4.3 mm., width 1.17 mm., hemelytra extending well beyond apex of abdomen as in the male; head nearly globose, eyes scarcely raised from general outline of front and vertex; colored similarly to male. Head: Width .89 mm., vertex .42 mm. Antennae: Segment i, length .39 mm., yellowish, scarcely darker apically; ii, 1.57 mm., apical half strongly clavate (.14 mm. thick), black, basal half brownish black; iii, .91 mm., yellowish, dusky apically; iv, .43 mm., fuscous.

Female (brachypterous): Length 3.2 mm., width of abdomen 1.5 mm.; very similar to the macropterous form except hemelytra and abdomen; hemelytra attaining base of third abdominal segment, fuscous, large spot near base and apex pale, tips turned slightly upward; abdomen subglobose, black, shining, pleural fold prominent; antennal segment ii pale on basal half, clavate portion black.

Reported from England as occurring at the bases of grasses in moist situations.

New Hampshire, Canada.

Mecomma Fieber.

M. gilvipes (Stål).

Leptomerochoris gilvipes Stål, Stet. Ent. Zeit., xix, 187, 1858.

Reuter, Hem. Gymn. Eur., iii, 386, pl. 2, fig. 6, 1883.

Male: Length 4.5 mm., width 1.4 mm.; black; hemelytra much longer than body, pale, fuscous on clavus and slightly darkened elsewhere; legs pale yellowish.

Female: Length 2.7 mm., width of abdomen 1.5 mm.; black, brachypterous; segment i of antennae and base of iii pale, segment ii slightly thicker toward apex, clothed with long pubescence; legs large in proportion to the body, pale yellowish; pronotum nearly

quadrate, anterior angles rounded; calli large, rounded, rather indistinct, two punctures set close together just between; hemelytra short and rounded, extending only to middle of abdomen, yellowish translucent, hind wings appear as mere pads beneath.

Maine, New Hampshire, New York.

Cyrtorhinus Fieber.

C. caricis Fallen var. *vagus* Knight, new variety.

Smaller and darker colored than *caricis* Fallen; hemelytra fuscous, translucent, slightly paler along embolium but not distinctly greenish.

Male: Length 2.8 mm., width 1.2 mm. Head: Width .60 mm., vertex .32 mm.; black, shining, pale spots on vertex scarcely apparent. Rostrum, length .78 mm., scarcely attaining hind margins of middle coxae, pale, blackish at apex.

Antennae: Segment i, length .27 mm., black, apex pale; ii, .82 mm., black. Pronotum: Length .34 mm., width at base .81 mm. Hemelytra: uniformly fuscous, slightly paler along embolium; cuneus and membrane uniformly pale fuscous. Legs: Pale, coxae, hind femora except base and more narrowly at apex, fuscous.

This is the form which the writer has previously recorded as *caricis* Fallen, but on comparison with limited material from Europe, it cannot be said that the forms are identical. Therefore, it seems best to give this American form a varietal name in order to avoid confusion in identity. A specimen is at hand from Colorado which in size, color, and other characteristics, agrees with a single specimen of *caricis* Fallen (Reuter determination) from Finland, and therefore the record for that species must still hold good for North America.

Holotype: Male, 10 Sept., 1917, Rockaway Beach, Long Island, N. Y. (W. A. Hoffman); author's collection. Paratypes: Males and females (8), taken with type. NEW JERSEY—Female, 30 Sept., Lakehurst (Wm. T. Davis). NEW YORK—Females (3), Aug., Sept., Sea Cliff (Nathan Banks). VIRGINIA—Male, 13 Aug., 1915, Oceanview (V. A. Roberts).

Orthotylus Fieber.

Key to Species.

1. Pubescence composed of two types of hairs; dorsum with closely appressed scale-like hairs and intermixed with more erect pubescent hairs 2
- Pubescence composed of a single type of hair; dorsum with erect pubescent hairs only 3
2. Veins and areoles green, antennae green (p. 513) *flavosparsus*
- Veins and areoles infuscated, antennae infuscated apically (p. 514) *concolor*
3. Ground color green, dark markings if present not clouding the corium 4
- Ground color pale testaceous to black, sometimes greenish but in that case the hemelytra marked with fuscous and black areas .. 7

4. Small, length 3.8 mm.; membrane pale, veins about areoles green; antennal segments i and ii yellowish (p. 514) **chlorionis**
Larger, length 4.5 mm. or more; membrane more or less infuscated, veins sometimes green but in such case antennal segment i distinctly blackish 5
5. Tylus with small fuscous spot at base; antennal segment i yellowish to green, sometimes infuscated but when dark the membrane distinctly fuscous, or the calli practically flat and devoid of basal impression 6
Tylus without small fuscous spot at base; antennal segment i fuscous to black; membrane pale, veins about areoles green; calli moderately convex, an impressed line along basal margin; pubescence pale but rather coarse and prominent
(p. 515) **basicornis** n. sp.
6. Membrane pale, sometimes fumate basally, clavus never infuscated
(p. 519) **viridis**
Membrane uniformly fuscous; corium uniformly green, clavus sometimes with a dusky cloud ... **modestus** var. **immaculatus** n. var.
7. Form small, ovate; color a uniform whitish-testaceous, hemelytra translucent, head and callosities tinged with yellowish (p. 513) **catulus**
Form more elongate; hemelytra with fuscous areas, or at times nearly black 8
8. Color pale testaceous, hemelytra translucent and with fuscous markings very faint or nearly lacking in female; median line of head and scutellum, lateral margins of pronotum, and sides of body, black; antennae blackish, membrane slightly infuscated, veins brown (p. 517) **candidatus**
Ground color sometimes pale greenish or yellowish but dark markings of hemelytra distinct; other markings not as the above, sometimes the whole insect may become nearly black 9
9. Dorsum brownish black, slenderly pale only at base of corium and embolium, slightly translucent at base of cuneus; median line of pronotal disk and sometimes continued upon scutellum, pale; length 6.8 mm. (p. 517) **necopinus**
Hemelytra with more than slender base of corium and embolium pale; length usually less than 6 mm. (remainder of key for females only, see figures of genital claspers for males) 10
10. Female pronotum with lateral margins black, disk broadly pale or fulvous, sometimes with only median line pale 11
Female pronotum with lateral margins pale or greenish, disk usually blackish and frequently with median line pale 15
11. Pronotal disk with fulvous, sometimes the hemelytra also fulvous 12
Pronotal disk with pale or greenish 13
12. Hemelytra black, a broad pale stripe extending full length of corium and connecting with pale cuneus; legs fulvous, apical half of hind femora blackish (p. 516) **knighti**
Hemelytra chiefly fulvous or salmon colored; blackish each side of commissure and on embolium (p. 518) **submarginatus**
13. Pronotal disk broadly pale, scutellum black; basal half of corium and embolium, and slenderly bordering base of cuneus, pale; transversely blackish across apical half of hemelytra but leaving costal margin slenderly pale; membrane and apical half of cuneus uniformly dark fuscous (p. 516) **cruciatius**
Pronotal disk and hemelytra not so broadly pale 14
14. Embolium and outer margin of corium pale greenish, translucent; median line of scutellum pale (p. 522) **serus**
Corium blackish at outer margin except at base; scutellum black
(p. 521) **alni** n. sp.
15. Hind femora blackish except basally, scutellum broadly pale; clavus, apical half of corium, calli, and usually pronotal disk

- except median line and side margins, blackish; usually the paler parts of the dorsum tinged with reddish (p. 519) **ornatus**
 Femora greenish, sometimes the scutellum broadly pale but in such case the femora never dark 16
16. Pronotal disk with blackish rays each side of median line and thus connecting calli with basal margin 17
 Pronotal disk transversely pale behind calli, both the calli and basal margin of disk blackish but never joined to form rays each side of median line, dark color sometimes obsolete (p. 519) **modestus**
17. Smaller, length 5.2 mm.; veins paler than infuscation of membrane; corium with inner apical half infuscated but the pale color of basal half extending along claval suture and thus tending to separate dark color of corium from that of clavus (p. 520) **dorsalis**
 Larger, length 5.8 mm.; veins uniformly infuscated as the membrane; corium with inner apical half blackish, pale color of basal half not penetrating along claval suture to separate black of corium from that of clavus (p. 515) **neglectus** n. sp.



FIG. 79. *Orthotylus catulus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 80. *Orthotylus flavosparsus* Sahlberg,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. catulus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 106, 1916.

Male: Length 4.2 mm., width 1.64 mm.; in form suggestive of *Megalocoleus* but the arolia similar to species of *Orthotylus*; uniformly whitish-testaceous or testaceo-grayish, head and calli tinged with yellowish; hemelytra sometimes slightly infuscated, membrane pale fumate; dorsum clothed with erect, moderately sparse dusky pubescence; genital claspers distinctive of the species (fig. 79).

Female: Length 4.1 mm., width 1.66 mm.; very similar to the male but in form more robust.

Breeds on *Gnaphalium uliginosum*.

Branford, 20 July, 1905 (H. W. W.); Mount Carmel (Hamden), 25 May, 1906 (B. H. W.).

O. flavosparsus (Sahlberg).

Phytocoris flavosparsus Sahlberg, Acta Soc. Sci. Fenn., i, 411, 1842.

Proc. Cal. Acad. Sci., ser. 4, vi, 97, 1916.

Male: Length 4.2 mm., width 1.4 mm.; oblong-ovate; clear green, becoming yellowish on callosities, head and lower surface; membrane slightly infumed, the areoles and veins green.

Female: Similar to the male but slightly more robust.

Food plant: *Chenopodium album*.

New Canaan, 29 Sept., 1909 (W. E. B.); New Haven, 26 July, 1905 (H. L. V.), 14 June, 1920 (W. E. B.); South Meriden, 16 July, 1915 (H. L. J.); Stratford, 9 July, 1920 (B. H. W.); Stratford, 21 July, 1908 (W. E. B.).

O. concolor (Kirschbaum).

Capsus concolor Kirschbaum, Jhrb. Ver. Nat. Herz. Nassau, x, 249, 315, 1855.

Reuter, Hem. Gymn. Eur., iii, 366, 553, 1883.

Male: Length 4.6 mm., width 1.5 mm.; deep green, head and femora tinged with yellowish, membrane uniformly infuscated; antennal segment ii strongly yellowish, infuscated apically, segments iii and iv blackish; clothed with erect black hairs, longest on head and anteriorly on pronotum, but pronotum, scutellum, and basally on hemelytra also clothed with closely appressed, silvery scale-like hairs.

Female: Length 4.2 mm., width 1.6 mm.; very similar to the male but more robust.

Massachusetts.

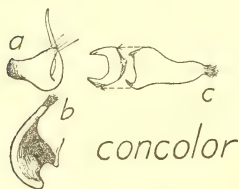


FIG. 81. *Orthotylus concolor* Kirschbaum,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

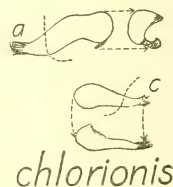


FIG. 82. *Orthotylus chlorionis* Say,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. chlorionis (Say).

Capsus chlorionis Say, Heter. N. Harm., 25, 1832; Compl. Writ., i, 346, 1859.

Proc. Cal. Acad. Sci., ser. 4, vi, 98, 1916.

Male: Length 3.8 mm., width .61 mm.; clear green, clothed with minute fuscous hairs, apparently destitute of pale scale-like hairs; membrane pale, veins only green; abdomen reaching to near apex of cuneus.

Female: Similar to the male but slightly more robust.

Occurs on honey locust (*Gleditsia tricanthos*).

New Haven, 22 June, 1905 (H. L. V.); Noroton, 21 June, 1913 (A. H. Renshaw).

Orthotylus basicornis Knight, new species.

Male: Length 5.6 mm., width 1.66 mm.; very similar to *viridis* but distinguished by the genital claspers (fig. 83), black antennal segment i, green veins about areoles, and by the more prominent, rather coarse pale pubescence.

Female: Length 5.7 mm., width 1.77 mm.; uniformly green like the male but slightly more robust; antennal segment i slightly paler but still distinctly blackish.

Breeds on *Salix longifolia*.

Holotype: Male, 10 Aug., 1916, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: taken with the type. Paratypes: Female, topotypic. ILLINOIS—Female, 30 June, 1906, male, 15 July (at light), Chicago; female, 24 July, 1908 (W. J. Gerhard). Males (4) and female, 2 July, 1917, Freeport (J. R. Malloch). MICHIGAN—Male, 21 June, 1919, Berrien County (R. F. Hussey). MINNESOTA—Males (14) and females (7), 12 July, 1919, Hennepin County (H. H. Knight), on *Salix longifolia*. Males (2) and females (2), 6 July, male, 10 July, University Farm, St. Paul (H. H. Knight), collected at light. Males and females (72), 18 July, 1922, Ramsey County; males and females (98), 1 July, 1922, Winona County (H. H. Knight). QUEBEC—Female, 19 July, 1914, Hull (J. L. Beaulne). Male and females (2), 28 July, 1915, Roberval (G. Beaulieu).

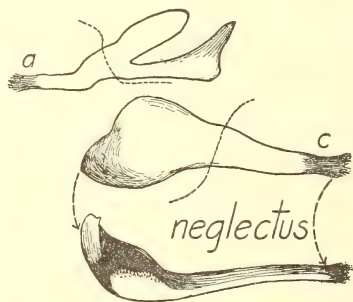
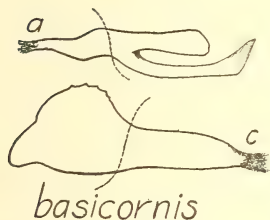


FIG. 83. *Orthotylus basicornis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

FIG. 84. *Orthotylus neglectus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

***O. neglectus** Knight, new species.

Male: Length 5.4 mm., width 1.75 mm.; color pattern very similar to *dorsalis* but the genital claspers (fig. 84) indicate that it is more closely related to *basicornis* and *knightsi*; black, rostrum except apex, slender lateral margin of pronotal disk, cuneus, embolus, and outer margin of corium, greenish; legs greenish, darkened at base of coxae and tips of tarsi; membrane and veins uniformly blackish. Rarely, pale forms may occur having median line of pronotum and scutellum pale.

Female: Length 5.8 mm., width 1.9 mm.; more robust than the male, usually more broadly pale; pronotal disk with blackish stripe each side of median line, extending from basal margin up to and including the calli; scutellum with median line pale; clavus black, corium with inner apical half blackish, pale color of basal half not penetrating along claval suture to separate black of corium from that of clavus.

Breeds on *Salix nigra*.

Holotype: Male, 3 July, 1920, McLean Bogs, Tompkins County, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: CONNECTICUT—Females (2), 5 June, 1921, Cornwall (B. H. Walden). NEW YORK—Males (14) and females (8), 27 June, 1916, Honeoye Falls (H. H. Knight). Male, 1 July, 1917, Cranberry Lake (C. J. Drake). NOVA SCOTIA—Females (2), 13 July, 1913, Truro (R. Matheson); these specimens more broadly pale, the scutellum and pronotal disk with median line pale.

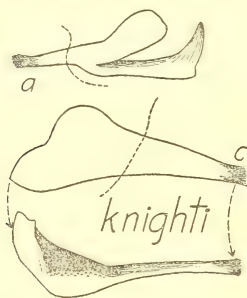


FIG. 85. *Orthotylus knighti* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

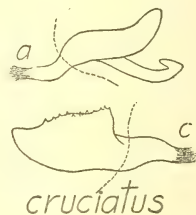


FIG. 86. *Orthotylus cruciatus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. knighti Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 121, 1916.

Male: Length 5.4 mm., width 1.58 mm.; black, spot on pronotal disk, legs except apical half of hind femora, fulvous; a broad pale stripe extending full length of corium and connecting with pale cuneus, in darker specimens somewhat obscured; genital claspers distinctive of the species (fig. 85).

Female: Length 5.4 mm., width 1.66 mm.; very similar to the male but more robust; pronotum more broadly fulvous.

Food plant: *Populus candicans*.

New York.

O. cruciatus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 119, 1916.

Male: Length 5.7 mm., width 1.7 mm.; pronotal disk broadly

pale, scutellum black; basal half of corium and embolium, and slenderly bordering base of cuneus, pale; transversely blackish across apical half of hemelytra but leaving costal margin slenderly pale; membrane and apical half of cuneus uniformly dark fuscous; genital claspers (fig. 86) distinctive of the species.

Female: Length 5.6 mm., width 1.72 mm.; differing very slightly from the male, sometimes more broadly pale.

Farmington, 19 June, 1919 (M. P. Z.); Hamden, 18 July, 1920 (B. H. W.); Hartford, 25 June, 1914 (W. M.); New Haven, 23 June, 1911 (A. B. C.).

O. necopinus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 125, 1916.

Male: Length 6.6 mm., width 2.11 mm.; brownish black, juga, vertex and extending along front of eyes, median line of pronotal disk and frequently extending upon scutellum, base of embolium and slenderly at base of radius, bordering cuneal fracture, pale to pale translucent; basal half of venter beneath and coxae, pale; femora and tibiae testaceous to fuscous; genital claspers (fig. 87) distinctive of the species.

Female: Length 6.8 mm., width 2.2 mm.; very similar to the male but frequently more broadly pale.

Breeds on *Betula lutea* but only in cool, damp, shaded situations.

New Hampshire, New York.

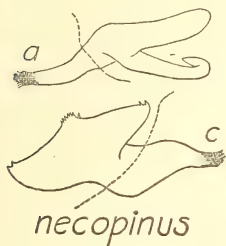


FIG. 87. *Orthotylus necopinus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

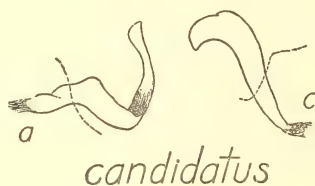


FIG. 88. *Orthotylus candidatus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. candidatus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 124, 1916.

Female: Length 4.5 mm., width 1.53 mm.; testaceous, sometimes tinged with fulvous; sides of body, median line of head and scutellum, black; antennal segments iii and iv, and apex of ii, brownish black; membrane pale, fumate bordering veins.

Male: Length 4.3 mm., width 1.3 mm.; more slender than the female but very similar in coloration, although the pronotum and

scutellum somewhat more broadly black; head and antennae black, vertex with pale spot each side bordering the eye. Genital claspers (fig. 88) very distinctive, in fact indicating that this species should not be placed in this section of the genus *Orthotylus*.

Food plant: American aspen (*Populus tremuloides*).

Originally described from a single female specimen collected on Mt. Washington, N. H., by Mrs. A. T. Slosson. In Minnesota, the writer has collected nymphs and adults on aspen (*Populus tremuloides*) but only on certain trees found along the shore of Lake Superior, just north of Two Harbors. Other trees of the same species, standing only a few feet back from the edge of the high bank which forms the shore line, did not produce specimens of *andidatus*.

Mt. Washington, N. H., Minnesota.

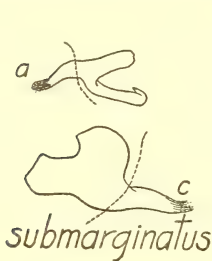


FIG. 89. *Orthotylus submarginatus* Say,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

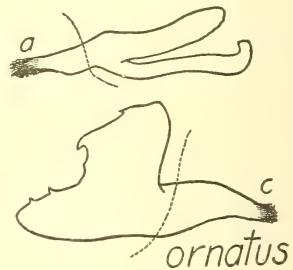


FIG. 90. *Orthotylus ornatus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. submarginatus (Say).

Capsus submarginatus Say, Heter. N. Harm., 23, 1832: Compl. Writ., i, 344, 1859.

Proc. Cal. Acad. Sci., ser. 4, vi, 123, 1916.

Male: Length 4.6 mm., width 1.33 mm.; dorsum pale salmon yellow, antennae, front of head, lateral margins of pronotal disk, scutellum, rather broadly each side of commissure, embolium and invading corium apically, apex of cuneus, and membrane, blackish or black; rostrum except apex, and legs chiefly, pale; hind femora dusky, the tibiae more nearly black.

Female: Length 4.8 mm., width 1.44 mm.; very similar to the male but more broadly salmon yellow above; venter white beneath, the dorso-lateral margin black; ostiolar peritreme fuscous, epimera and sternum beneath blackish.

Breeds on *Robinia pseudacacia*.

Stratford, 9 July, 1920 (B. H. W.).

O. ornatus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 122, 1916.

Male: Length 5.6 mm., width 1.78 mm.; chiefly black or brownish black, tip of scutellum, basal angles of corium, pale to pale translucent; membrane fuscous, veins and spot on middle of apical half, slightly paler; legs pale to dusky, femora brownish black, the hind pair darker; genital claspers (fig. 90) distinctive of the species.

Female: Length 6 mm., width 2.05 mm.; chiefly pale, tinged with reddish and varied with fuscous; base of tylus and spot just above, sometimes an arc on front, basal margin of calli, pronotal disk except median line and lateral margins, basal angles of scutellum, apical half of corium, and clavus somewhat, fuscous to blackish; antennae pale fusco-brownish, segment i darker; hind femora brownish black. Sometimes this sex may be more broadly blackish and the paler parts not at all tinged with reddish.

Breeds on *Salix fragilis*.

Cornwall, 5 June, 1921 (B. H. W.); Guilford, 13 July, 1920 (B. H. W.).

O. viridis Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 103, 1916.

Male: Length 4.6 mm., width 1.47 mm.; pale green, with head, pronotum anteriorly, embolium, and femora, yellowish, base of tylus with small fuscous spot; antennae yellowish, segments i, iii, and iv, darkened with pale fuscous; membrane pale to fumate basally; genital claspers (fig. 91) distinctive of the species.

Female: Length 5 mm., width 1.58 mm.; very similar to the male in coloration but in form more robust.

Breeds on *Salix*.

Guilford, 13 July, 1920 (B. H. W.).

O. modestus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, vi, 109, 1916.

Male: Length 4.4 mm., width 1.44 mm.; fuscous to blackish, head and paler parts of hemelytra tinged with yellowish; embolium pale, base of corium and continuing rather broadly along radius, and cuneus, greenish yellow; membrane uniformly infuscated, the veins scarcely paler; antennae fusco-brownish, segment i darker; genital claspers (fig. 92) distinctive of the species.

Female: Length 4.5 mm., width 1.47 mm.; pale greenish, legs darker, dorsum marked with blackish; antennae, spot at base of tylus, transversely across base of calli, basal margin of pronotal disk but not attaining lateral angles, basal angles, and spot on median line at base of scutellum, clavus except basal angles, and spot on inner apical angle of corium, fuscous to black; membrane uniformly dark fuscous.

Breeds on *Salix fragilis* and *S. nigra*.

New York.

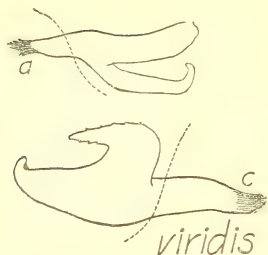


FIG. 91. *Orthotylus viridis* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

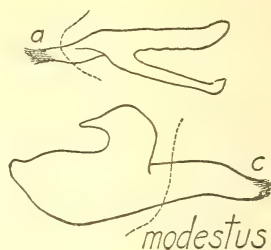


FIG. 92. *Orthotylus modestus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. modestus var. immaculatus Knight, new variety.

Structurally not distinguishable from the typical *modestus* but uniformly green in color; corium always immaculate but sometimes the clavus with a dusky cloud; membrane uniformly fuscous; genital claspers similar to those of *modestus*.

Holotype: Male, 19 July, 1916, Batavia, N. Y. (H. H. Knight); author's collection. Paratypes: Females (5), taken with type. NEW YORK—Female, 2 Aug., 1916, Honeoye Falls (H. H. Knight). Male and female, 5 July, Cold Spring Harbor, Long Island (H. M. Parshley). ONTARIO—Male, 15 July, male, 21 July, 1914, Ottawa (G. Beaulieu).

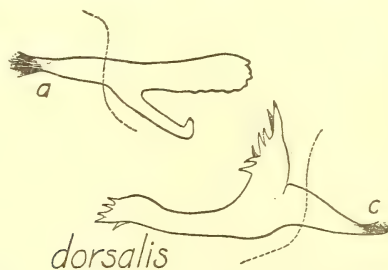


FIG. 93. *Orthotylus dorsalis* Provancher,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

O. dorsalis (Provancher).

Lygus dorsalis Provancher, Nat. Can., iv, 104, 1872.
Proc. Cal. Acad. Sci., ser. 4, vi, 110, 1916.

Male: Length 4.9 mm., width 1.49 mm.; elongate, costal margins of hemelytra nearly parallel; black, cuneus, embolium, corium basally and extending rather broadly along radius, greenish translucent, frequently median line of pronotum paler; rostrum except

apex and legs green, coxae paler; membrane fuscous, veins slightly paler.

Female: Length 5.2 mm., width 1.6 mm.; pale green to greenish yellow, jugs, arc or spot each side of front, stripe each side of median line and extending from inner basal angles of calli to basal margin of disk, scutellum except median line (usually), clavus except basally, large spot on inner apical angles of corium, dark fuscous to black; pale color of corium extending along claval suture and thus tending to separate dark color of apical area from that of clavus; membrane infuscated but veins distinctly paler; body with lateral black stripe, more distinct on propleura, sometimes quite reduced on venter; legs green, femora more yellowish, tip of rostrum and apices of tarsi blackish.

This description and figures are drawn from specimens determined as *dorsalis* Provancher by Mr. Van Duzee in 1916, while working on a monograph of the genus *Orthotylus*.

Breeds on *Salix*.

Hamden, 11 June, 1921 (B. H. W.); Litchfield, 22 July, 1920 (P. G.); North Branford, 13 July, 1920 (B. H. W.).

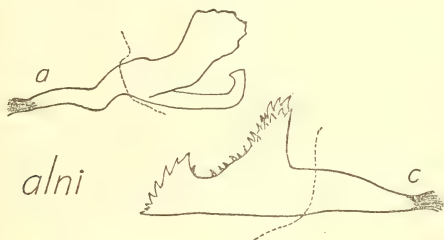


FIG. 94. *Orthotylus alni* Knight,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Orthotylus alni Knight, new species.

Male: Length 6.1 mm., width 1.7 mm.; black, slenderly bordering front margin of eyes, median vitta on basal half of pronotal disk, bordering radial vein to beyond middle of corium, spot at base of cuneus, pale to translucent; rostrum except apex, and legs, dark green; tarsi, knees, and apically on tibiae, fuscous or blackish; membrane and veins uniformly dark fuscous.

Female: Length 5.6 mm., width 1.83 mm.; very little paler than the male, vitta on pronotal disk sometimes broader, embolium at base and the cuneus more broadly translucent.

Food plant: *Alnus rugosa*.

Holotype: Male, 3 July, 1920, McLean Bogs, Tompkins County, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: NEW YORK—Males (2) and females (18), taken with the types. MAINE—Male, 15 July, 1909, Eastport (C. W. Johnson).

O. serus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, xi, 131, 1921.

Male: Length 5.3 mm., width 1.58 mm.; black, median line of pronotal disk and scutellum, pale; embolium, outer margin of corium and cuneus, pale greenish, translucent; genae, gula, bucculae, rostrum except apex, sternum, and legs, greenish yellow; membrane and veins uniformly dark fuscous.

Female: Length 5.56 mm., width 1.61 mm.; very similar to male in form and coloration; hemelytra with costal margins nearly parallel; sometimes the pronotal disk, vertex, and front bordering eyes, more broadly pale than male.

Breeds on *Crataegus* and cultivated apple.

New York.

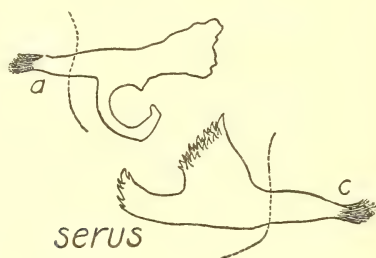


FIG. 95. *Orthotylus serus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Diaphnidia Uhler.**D. pellucida** Uhler.

Uhler, Hemiptera Colo., 44, 1895.

Length 4.3 mm., width 1.4 mm.; uniformly pellucid greenish white, the antennae included; eyes and tips of tarsi fuscous.

Food plants: Apple, *Ostrya virginiana*, and probably other plants.

New Haven, 7 July, 1920 (B. H. W.).

D. provancheri (Burque).

Pet. Faune Ent. Can., iii, 144, 1887.

Length 5 mm., width 1.2 mm.; pellucid greenish yellow, more green on hemelytra than elsewhere; tibiae lightly infuscated; antennal segment ii black, following segments fuscous.

Food plants: White oak, and probably other plants.

Massachusetts, New York.

D. capitata Van Duzee.

Bull. Buffalo Soc. Nat. Sci., x, 490, 1912.

Length 3 mm.; pale, smaller than *pellucida*; distinguished by the black head and fuscous basal segment of the antennae.

Food plant: Witchhazel (*Hamamelis virginiana*).

Long Island, N. Y.

Reuteria Puton.

R. irrorata (Say).

Compl. Writ., i, 346, 1859.

Length 4.3 mm., width 1.5 mm.; pale whitish, usually marked with marbled green spots; distinguished by the longitudinal black marks on antennae.

Food plants: Basswood (*Tilia*), and white oak (*Quercus*).

New York.

Noctuocoris Knight, new genus.

Arolia erect and converging at the apices as in *Orthotylus*; general aspect more nearly that of certain species of *Phytocoris*. Head distinctly oblique in female but much less so in the male; vertex ecarinate, beset with a row of erect bristles at base; an alutaceous glabrous spot each side of vertex bordering eye; clypeus large and prominent, facial angle a right angle or slightly greater; front only slightly convex. Eyes large, prominent, viewed from the side a little oblique in female, larger and more nearly vertical in male. Rostrum short, scarcely attaining hind margin of mesosternum. Pronotum moderately sloping, very little convex, sides nearly straight, forming a line which would, if projected, strike inner half of eye; callosities moderately convex, delimited behind by an impressed line which continues to an impression between the calli. Pubescence composed of two kinds of hairs, a closely appressed scale-like type, and interspersed with more erect pubescent hairs. Legs long, suggesting *Phytocoris* but femora not distinctly broader at base. Abdomen with a lateral line formed by a series of impressed glabrous spots, one on each segment (genital segments excepted) situated just below the spiracle; both sexes with abdomen reaching to about middle of cuneus. Genital claspers distinctive in type (fig. 96).

Genotype: *Orthotylus fumidus* Van Duzee.

N. fumidus (Van Duzee).

Proc. Cal. Acad. Sci., ser. 4, vi, 127, 1916.

Male: Length 5.7 mm., width 1.7 mm.; color uniformly fuscous-brown, slender apex of scutellum pale; clothed with sericeous, closely appressed, silvery and black, scale-like pubescence, and interspersed with more erect pubescent hairs, longer and more bristly at anterior margin of pronotum and on head; anterior face of femora with a more or less broken fuscous line, dorsal margin at base and frequently the posterior face with a series of dark

spots; sternum nearly black, ventral aspect of face and lower margin of propleura pale grayish; membrane uniformly fuscous, veins slightly paler at apex of brachium; genital claspers distinctive of the species (fig. 96).

Female: Length 6 mm., width 2 mm.; very similar to the male in coloration but in form slightly larger and more robust.

In habit this species appears to be largely nocturnal; all specimens thus far collected have been taken at light.

Allotype: Male, 7 July, 1913, Batavia, N. Y. (H. H. Knight); author's collection.

New York, Pennsylvania, Michigan, Minnesota, South Dakota, Colorado.

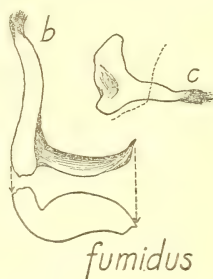


FIG. 96. *Noctuocoris fumidus* Van Duzee,—male genital claspers, (b) left clasper, dorsal aspect, (c) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Heterocordylus Fieber.

H. malinus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 71, 1909.

Length 5.7-6.1 mm., width 2.2 mm.; black, usually marked with red; males black, usually with a patch of red on basal angles of pronotum and on basal angles of hemelytra; clothed with very fine yellowish pubescence and intermixed with rather sparsely placed tufts of white, deciduous, tomentose pubescence. Females usually with the basal half of pronotum, embolium, inner half of corium, base and exterior margin of clavus, and cuneus, red; more rarely, entirely black as in the male.

Food plants: *Crataegus* and apple; pest on apple in New York. New Hampshire, New York.

Tribe CERATOCAPSINI.

Key to Genera.

1. Pronotum anterior to middle, nearly cylindrical, rather abruptly flaring behind middle, basal half of disk strongly convex; embolar margins sulcate on basal half (p. 535) **Pamillia**
- Pronotum regularly narrowed anteriorly, its sides not constricted at middle; embolar margins not distinctly sulcate **Ceratocapsus**

Ceratocapsus Reuter.*Key to Species.*

1. Clothed only with simple pubescence, sometimes with prominent long pilose hairs 2
Clothed with two types of pubescence, bearing more or less closely appressed sericeous, or scale-like pubescence, and usually intermixed with more erect pubescent hairs 5
2. Head largely, and the antennae, red; dorsum uniformly yellowish; length 4.5 mm. (p. 527) *lutescens*
Head and antennae not distinctly red; dorsum more or less darkened 3
3. Dorsum without transverse fascia 4
Dorsum dark brownish, a broad pale or yellowish fascia across hemelytra just beyond tip of scutellum (p. 526) *fasciatus*
4. Robust; head and thorax not or scarcely darker than hemelytra; brownish black, basal half of hemelytra frequently paler; length 4.3 mm. (p. 527) *modestus*
Slender; head and thorax black, hemelytra yellowish but with fuscous cloud on corium; length 4.5 mm. (p. 534) *nigrocephalus* n. sp.
5. (1) Dorsum without transverse pale fascia 6
Dorsum dark brownish, a broad pale fascia across hemelytra just beyond tip of scutellum (p. 526) *pilosus* n. sp.
6. Pronotum impunctate, somewhat alutaceous 7
Pronotum punctate, sometimes rather finely so yet distinct 10
7. Dorsum sparsely clothed with fine short pubescence, sometimes with a few scattering long hairs on scutellum and hemelytra 8
Dorsum clothed with rather sparsely set, prominent, long erect pilose hairs; dark brownish black, legs and antennal segments i and ii yellowish; length 4.1 mm. (p. 530) *sericus* n. sp.
8. Antennal segment iii, in length, greater than width of vertex plus dorsal width of an eye 9
Antennal segment iii, in length, not equal to width of vertex plus dorsal width of an eye; dorsum uniformly yellowish (p. 527) *luteus* n. sp.
9. Antennal segment iii, in length, not equal to width of head; thorax reddish, basal half of hemelytra paler than apical half; legs yellowish; smaller, length 3.4 mm. (p. 529) *vicinus* n. sp.
Antennal segment iii, in length, equal to width of head; thorax blackish, hemelytra brownish black except for small spot at basal angle of corium and embolium; legs dark reddish brown or blackish; larger, length 4.4-4.7 mm. (p. 528) *nigellus* n. sp.
10. (6) Antennal segment iii, in length, greater than width of vertex plus dorsal width of an eye 11
Antennal segment iii, in length, not exceeding width of vertex plus dorsal width of an eye 13
11. Antennal segment iii, in length, equal to or greater than width of head 12
Antennal segment iii, in length, not equal to width of head (p. 531) *pumilus*
12. Smaller, length, female 2.5 mm., male 3.1 mm.; male cuneus colored similarly to corium; female ovate, brachypterous .. (p. 535) *setosus*
Larger, length, male 4.5 mm.; cuneus red, corium yellowish brown (p. 533) *drakei* n. sp.
13. (10) Width of vertex greater than dorsal width of an eye; female femora greenish or yellowish, not distinctly reddish on apical half 14
Width of vertex (male) less than dorsal width of an eye; female hind femora reddish on apical half, cuneus red, corium yellowish brown translucent (p. 531) *fuscinus* n. sp.

14. Dorsum densely clothed with erect, rather bristly pubescence; apical half of membrane scarcely darker than basal half; basal prong of right genital clasper taking the form of a small finger-like process (p. 533) *digitulus* n. sp.
 Dorsum more sparsely clothed with semierect pubescence, nearly as in *pumilus*; apical half of membrane distinctly infuscated; basal process of right genital clasper taking the form of a thin chitinous plate, notched at apex, the dorsal portion drawn out to a slender point (p. 532) *incisus* n. sp.

C. fasciatus (Uhler).

Bull. U. S. Geol. Geog. Surv., iii, 421, 1877.

Length 3.2 mm., width 1.4 mm.; dark chestnut brown with legs and antennae paler; hemelytra with a broad transverse pale yellowish band just beyond tip of scutellum, scarcely paler on cuneal fracture; clothed only with fine recumbent yellowish pubescence.

Occurs on hickory (*Carya*).

New York.

Ceratocapsus pilosus Knight, new species.

Very similar to *fasciatus* in size and coloration but readily distinguished by the long pilose hairs on head and dorsum.

Male: Length 3.4 mm., width 1.3 mm. Head: Width .71 mm., vertex .33 mm.; yellowish brown to dark brown, clothed with fine pubescence, the front beset with several prominent erect hairs. Rostrum, length 1.17 mm., attaining hind margins of posterior coxae, brownish.

Antennae: Segment i, length .28 mm., thickness .10 mm., yellowish; ii, 1.01 mm., tapering gradually thicker from base toward apex (.10 mm. thick), yellowish brown; iii, .64 mm., thickness .09 mm., brownish; iv, .48 mm., thickness .08 mm., dark brown.

Pronotum: Length .58 mm., width at base 1.16 mm.; calli scarcely apparent, transversely rugulose near anterior margin, lateral margins of disk moderately yet distinctly sulcate; thickly clothed with fine yellowish pubescence, margins of disk beset with prominent pilose hairs; color dark brown, moderately shining. Scutellum dark brown, transversely rugulose, finely pubescent and beset with several erect pilose hairs. Sternum and episterna dark brown, shining; epimera and meta-episterna pruinose; ostiolar peritreme strongly protruding, white.

Hemelytra: Embolar margins very slightly arcuate; dark fusco-brownish, a broad transverse, pale yellowish fascia just beyond apex of scutellum, cuneal fracture also pale; clothed with very fine, closely appressed, sericeous pubescence, intermixed with longer recumbent pubescence and sparsely set erect pilose hairs, pubescence taking color of surface beneath. Membrane pale, apical half and central area fuscous.

Legs: Pale brownish to fusco-brownish. Venter dark brown,

shining, a pruinose area on middle of ventral surface; clothed with prominent yellowish pubescent hairs; genital claspers distinctive.

Female: Length 3.6 mm., width 1.6 mm.; colored very similarly to the male but in form more robust, embolar margins more strongly arcuate on apical half.

Holotype: Male, 28 July, 1916, Pigeon Cove, Mass. (Chris E. Olsen); author's collection. Allotype: same data as the type. Paratypes: MASSACHUSETTS—Males (3), taken with the types. MINNESOTA—Males (3) and females (2), 20 July, 1920, Gray Cloud Island, collected on *Ostrya virginiana*; males (2), 8 July, males and females (12), 5 Aug., males and females (18), 11 Aug., 1920, University Farm, St. Paul, collected on *Quercus macrocarpa*; male and female, 9 July, males and females (10), 24 July, Minnehaha Creek, Hennepin County (H. H. Knight).

C. lutescens Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 87, 1876.

Length 4.5 mm., width 1.9 mm.; uniformly yellowish, antennae, head chiefly, and two vittae on anterior angles of propleura, red; sparsely clothed with yellowish pubescence.

Long Island, N. Y.

C. modestus Uhler.

Ent. Amer., iii, 69, 1887.

Length 4.4 mm., width 1.8 mm.; dark chestnut brown with yellowish, sometimes dark fuscous brown; larger than *pumilus* and without distinct punctures on dorsum; surface very finely alutaceous; scutellum, clavus, and inner apical margin of corium, beset with a few long erect hairs, but devoid of closely appressed sericeous pubescence.

Occurs on basswood (*Tilia*), and grapevine (*Vitis* sp.).

East River, 30 July, 1910, 5 Aug., 1908 (C. R. E.); New Haven, 8 July, 1909 (B. H. W.).

C. luteus Knight, new species.

Suggestive of *lutescens* but differs in structure of antennae and pubescence, likewise in color of antennae and head.

Female: Length 4 mm., width 1.64 mm. Head: Width .87 mm., vertex .34 mm.; yellowish, eyes brownish black. Rostrum, length 1.32 mm., nearly attaining hind margins of middle coxae, yellowish, darker apically.

Antennae: Segment i, length .31 mm.; ii, 1.14 mm., slender at base, becoming gradually thicker apically but not attaining thickness of segment i, yellowish, somewhat dusky near apex; iii, .51 mm., thickness .08 mm., just equal to apex of segment ii, dusky yellow; iv, .43 mm., equal in thickness to segment iii, dusky brown.

Pronotum: Length .73 mm., width at base 1.34 mm.; lateral margins nearly straight; impunctate, somewhat alutaceous, yellowish, clothed with very fine recumbent yellowish pubescence. Scutellum transversely rugulose, clothed with closely appressed, silvery scale-like pubescence, and intermixed with a few very short simple pubescent hairs. Sternum and pleura yellowish, ostiolar peritreme pale yellowish.

Hemelytra: Embolar margins slightly sinuate; uniformly yellowish translucent, impunctate; pubescence as on scutellum, scale-like pubescence more abundant on clavus and inner half of corium. Membrane uniformly pale fumate, becoming more nearly pale fuscous at apex, veins tinged with yellowish.

Legs: Uniformly yellowish. Venter uniformly yellowish, yellowish pubescent.

Male: Length 3.8 mm., width 1.46 mm.; very similar to the female in form and coloration. Head: Width .80 mm., vertex .26 mm. Antennae: Segment i, length .28 mm., yellowish; ii, 1.03 mm., yellowish, brownish on apical half; iii, .50 mm., fusco-brownish; iv, brownish black; similar in structure to antennae of female.

Holotype: Female, 18 July, 1915, White Plains, N. Y. (J. R. T. Bueno); author's collection. Allotype: Male, 20 Aug., 1891, Berkeley, W. Va. (O. Heidemann); Cornell Univ. collection.

***Ceratocapsus nigellus* Knight, new species.**

Resembles dark forms of *modestus* but readily distinguished by the type of pubescence; scutellum and basal half of hemelytra bearing closely appressed, sericeous or scale-like pubescence.

Male: Length 4.5 mm., width 1.7 mm. Head: Width .83 mm., vertex .34 mm.; brownish black, front coarsely alutaceous, shallow groove on median line above, basal carina raised to a sharp angle. Rostrum, length 1.7 mm., attaining hind margins of middle coxae, dark brownish.

Antennae: Segment i, length .43 mm., thickness .11 mm.; ii, 1.56 mm., gradually thickened from base to apex (.11 mm. thick); iii, .84 mm., thickness .13 mm.; iv, .63 mm., thickness .13 mm.; clothed with short, closely set pubescence, dark reddish brown to blackish.

Pronotum: Length .93 mm., width at base 1.66 mm.; alutaceous, finely and sparsely pubescent, lateral margins of disk very slightly sulcate; dark brownish black. Scutellum blackish, transversely rugulose, clothed with closely appressed, silvery scale-like hairs, and intermixed with a few fine erect pubescent hairs. Sternum dark brownish black, shining, meta-episterna pruinose; ostiolar peritreme coarsely alutaceous, dark reddish brown.

Hemelytra: Embolar margins slightly sinuate; dark brownish black, cuneus frequently more reddish brown; clavus and basal half of corium clothed with closely appressed scale-like hairs as on scutellum, and sparsely interspersed with more erect, simple pubescent hairs. Membrane and veins uniformly fuscous, slightly paler bordering apex of cuneus.

Legs: Dark reddish brown to blackish, anterior and middle pair of tibiae more yellowish brown. Venter dark reddish brown to black, genital segment strongly shining and beset with rather prominent pubescent hairs; genital claspers distinctive of the species.

Female: Length 4.6 mm., width 1.84 mm.; very similar to the male in form and color.

Holotype: Male, 14 July, 1916, Batavia, N. Y. (H. H. Knight); author's collection. *Allotype*: same data as the type. *Paratypes*: Males and females (30), taken with the types on hickory. *GEORGIA*—Male and female, July, 1910, Rabun County (Wm. T. Davis). *MARYLAND*—Male, 21 June, 1914, Plum Point (W. L. McAtee). *MINNESOTA*—Female, 20 July, 1920, Gray Cloud Island (H. H. Knight). *NORTH CAROLINA*—Female, 14 June, 1915, Southern Pines (A. H. Manee). Males and females (8), July, 1912, Black Mountains (Beutenmuller). *NEW JERSEY*—Female, 2 July, Jamesburg (Wm. T. Davis). *NEW YORK*—Males and females (7), 17 July, males and females (12), 31 July, female, 6 Aug., 1916, females (2), 13 Aug., 1915, Batavia (H. H. Knight), collected on hickory. Males and females (5), 16 July, 1916, Conesus Lake; males and females (6), 23 July, 1916, Ithaca (H. H. Knight). Female, 7 Aug., 1915, White Plains (J. R. T. Bueno). Males (4) females (3), 30 June, 1922, Kings Bluff, Winona Co., Minn. (H. H. Knight).

Collected most frequently on hickory (*Carya* sp.). Nymphs have been taken on the trunks and larger limbs of trees, indicating that the species may be largely predaceous.

C. vicinus Knight, new species.

Fulvous to reddish, scutellum and apical half of hemelytra dark brownish to blackish, legs and antennae yellowish; dorsum clothed with rather inconspicuous simple pubescence, scutellum and basal half of hemelytra thickly clothed with closely appressed, scale-like silvery pubescence.

Male: Length 3.4 mm., width 1.4 mm. Head: Width .78 mm., vertex .31 mm.; yellowish to reddish, front coarsely alutaceous, vertex and front beset with a few erect yellowish hairs. Rostrum, length 1.43 mm., reaching upon hind coxae, reddish, yellowish apically.

Antennae: Segment i, length .31 mm., yellowish, frequently a red mark on ventral surface; ii, 1.23 mm., thickness at apex .10 mm., yellowish, more brownish at apex; iii, .66 mm., thickness .08 mm., reddish brown, paler at base; iv, .48 mm., reddish brown.

Pronotum: Length .71 mm., width at base 1.23 mm.; lateral margins of disk nearly straight; fulvous to reddish, moderately shining; calli outlined but inconspicuous, alutaceous; sparsely clothed with fine yellowish pubescence. Scutellum dark reddish brown, transversely rugulose, thickly clothed with closely appressed, silvery scale-like pubescence. Sternum and pleura reddish to brownish, meta-episterna pruinose; ostiolar peritreme reddish.

Hemelytra: Embolar margins slightly sinuate; yellowish to fulvous, apical half dark brownish to blackish; sparsely clothed with simple yellowish pubescence, clavus and basal half of corium covered with closely appressed, silvery scale-like pubescence. Membrane pale, apical half fuscous.

Legs: Uniformly yellowish, scarcely darker at base of coxae. Venter dark reddish brown to black, shining, genital segment

clothed apically with prominent yellowish hairs; genital claspers distinctive.

Female: Length 3.6 mm., width 1.6 mm.; more robust than the male but very similar in coloration; embolar margins more distinctly arcuate on apical half.

Holotype: Male, 8 July, Staten Island, N. Y. (Wm. T. Davis); author's collection. Allotype: 21 Aug., 1917, Wyandanch, Long Island, N. Y. (Chris E. Olsen). Paratypes: NEW JERSEY—Male, 11 July, 1908, female, 19 July, female, 23 July, female, 27 July, Lakehurst (Wm. T. Davis). NEW YORK—Female, 11 Aug., Pinelawn; female, Aug., 1916, Yaphank (Wm. T. Davis). Female, 21 Aug., 1917, Wyandanch, Long Island (C. E. Olsen).

Ceratocapsus sericus Knight, new species.

Dark brownish black, legs and antennae yellowish; form and size suggestive of *pumilus* but distinguished by the rather sparsely set, erect long pilose hairs.

Female: Length 4.1 mm., width 1.66 mm. Head: Width .77 mm., vertex .37 mm.; brownish, coarsely alutaceous, set with several long erect hairs. Rostrum reaching upon hind coxae (apex covered), brownish to dark brown.

Antennae: Segment i, length .39 mm., thickness .11 mm., yellowish; ii, 1.4 mm., slender at base and tapering to .10 mm. thick at apex, yellowish; iii, .74 mm., thickness .10 mm., dark reddish brown, yellowish at base; iv, .58 mm., thickness .09 mm., dark reddish brown.

Pronotum: Length .74 mm., width at base 1.34 mm.; lateral margins of disk slightly sulcate; dark brownish black, alutaceous, disk sparsely set with long erect pilose hairs. Scutellum dark brownish black, transversely rugulose, clothed with closely appressed, silvery scale-like pubescence, and interspersed with erect long pilose hairs. Sternum dark reddish brown, pleura blackish and somewhat alutaceous, meta-episterna pruinose; ostiolar peritreme yellowish to brown.

Hemelytra: Embolar margins slightly sinuate, somewhat arcuate on apical half; dark brownish black, somewhat translucent on embolium; rather sparsely beset with long erect, yellowish pilose hairs, clavus and basal half of corium clothed with closely appressed, silvery scale-like pubescence. Membrane and veins uniformly pale fuscous, a small clear spot bordering apex of cuneus.

Legs: Uniformly yellowish, coxae more brownish. Venter dark brownish black, somewhat shining, genital segments clothed with prominent yellowish hairs.

Male: Length 4 mm., width 1.57 mm.; very similar to the female in color. Antennae: Segment i, length .36 mm.; ii, 1.28 mm., yellowish, fuscous on apical one-third; iii, .67 mm., fuscous, narrowly yellowish at base. Genital segment distinctive.

Holotype: Female, 28 July, 1906, Newfoundland, N. J. (Wm. T. Davis); author's collection. Allotype: Male, 27 June, 1921, Ann Arbor, Mich. (R. F. Hussey). Paratypes: Female, taken with type. Female, 23 Aug., Mosholu, N. Y.

C. pumilus (Uhler).

Ent. Amer., iii, 69, 1887.

Length 3.6 mm., width 1.5 mm.; yellowish brown to dark brown; antennae and legs pale yellowish brown; dorsum distinctly punctured, thickly clothed with prominent yellowish pubescence and with shorter, silvery yellow, sericeous pubescence.

Occurs on grapevine (*Vitis* spp.).

East River 7 Sept., 1910 (C. R. E.).

C. fuscinus Knight, new species.

Closely related to *pumilus* but antennal segment iii shorter, eyes of male larger, vertex narrower; pubescence on dorsum heavier, more erect and prominent than in *pumilus*.

Male: Length 3.7 mm., width 1.61 mm. Head: Width .78 mm., vertex .26 mm.; yellowish; eyes larger and more coarsely granulate (facets larger) than in *pumilus*. Rostrum, length 1.14 mm., scarcely attaining hind margins of middle coxae, yellowish, basal segment and apex darker.

Antennae: Segment i, length .27 mm., yellow, a red spot on inner side at base; ii, 1.01 mm., slender at base and becoming gradually thicker toward apex, attaining the thickness (.08 mm.) of segment i, dusky pubescent, yellowish; iii, .51 mm., thickness .07 mm., yellowish, becoming darker on apical half; iv, .40 mm., equal to segment iii in thickness, fusco-brownish.

Pronotum: Length .68 mm., width at base 1.13 mm.; nearly as in *pumilus* but pubescence longer and more prominent; brownish black, basal one-fourth or more of disk yellowish. Scutellum yellowish brown, darker at base, clothed with prominent yellowish pubescent hairs; mesoscutum narrowly exposed. Sternum brownish, episterna and pleura blackish; ostiolar peritreme yellowish, becoming brownish above.

Hemelytra: Embolar margins slightly arcuate; yellowish brown translucent, somewhat fuscous on corium; punctures fine, blackish, clothed with prominent yellowish pubescent hairs and intermixed with shorter, closely appressed, sericeous or scale-like pubescence; cuneus reddish. Membrane pale fumate, a slightly darker but distinct cloud occupying middle of apical half.

Legs: Yellowish, hind femora reddish on apical half. Venter brownish black, more yellowish beneath; genital claspers very similar to those of *pumilus* but basal prong of right clasper twice as long as wide; both right and left claspers composed of three prongs each, hence the name.

Female: Length 3.6 mm., width 1.6 mm.; very similar to the male but embolar margins more strongly arcuate; pronotum more yellowish, only the calli and a ray across top of coxal cleft blackish; venter reddish to brownish.

Head: Width .73 mm., vertex .33 mm. Antennae: Segment i,

length .27 mm.; ii, .96 mm., slender, thickness at apex equal to segment iii; iii, .46 mm.; iv, .37 mm.; colored as in the male.

Holotype: Male, 2 Aug., 1916, Honeoye Falls, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (10) and females (4), taken with the types on *Salix nigra*. DISTRICT OF COLUMBIA—Male, 10 July, 1898, Washington (O. Heidemann). MARYLAND—Male, 10 July, Glen Echo (O. Heidemann). MINNESOTA—Males (2) and female, 12 July, 1921 (A. Hertig), male and female, 20 July, 1920, Gray Cloud Island, Ramsey County (H. H. Knight). NEW YORK—Males (4) and female, 4 Aug., males (2) and females (4), 6 Aug., males (3) and females (2), 10 Aug., female, 17 Aug., 1916, Batavia, New York (H. H. Knight). OHIO—Male, 17 July, 1915, Bay Point, (C. J. Drake).

Ceratopsus incisus Knight, new species.

General aspect very similar to *pumilus* but antennal segment iii shorter, apical half of membrane more distinctly infuscated while the femora remain uniformly yellowish or greenish; genital claspers distinctive.

Male: Length 3.7 mm., width 1.49 mm. Head: Width .71 mm., vertex .30 mm.; blackish, reddish beneath. Rostrum, length 1.38 mm., nearly attaining hind margins of middle coxae, yellowish, basal segment reddish, apex blackish.

Antennae: Segment i, length .28 mm., yellowish, tinged with reddish; ii, 1.07 mm., slender at base and gradually thickened toward apex, but not attaining the thickness of segment i, yellowish, dusky at apex; iii, .49 mm., brownish, nearly equal to thickness of segment ii; iv, .39 mm., brownish, equal to segment iii in thickness.

Pronotum: Length .64 mm., width at base 1.26 mm.; more blackish than in *fuscinus* but with pubescence very similar. Scutellum brownish black. Sternum reddish to blackish, pleura black; ostiolar peritreme pale, tinged with reddish.

Hemelytra: Nearly as in *fuscinus* but the corium darker, cuneus dark reddish brown. Membrane and veins fumate, apical half fuscous, margins slightly paler.

Legs: Yellowish to greenish, not distinctly darker on apical half. Venter dark reddish brown to piceous, scarcely paler beneath; genital claspers distinctive, basal prong of right clasper incised at apex, the dorsal portion drawn out to a slender point.

Female: Length 4 mm., width 1.7 mm.; very similar to the male. Head: Width .72 mm., vertex .33 mm. Antennae: Segment i, length .33 mm.; ii, 1.11 mm., slender, slightly thicker at apex, yellowish; iii, .49 mm., brownish, paler at base; iv, .39 mm., brownish.

Occurs on *Salix*.

Holotype: Male, 26 July, 1916, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (6) and females (2), taken with the types on *Salix*. NEW YORK—Males (2) and females (3), 29 July, male, 30 July, male, 6 Aug., 1916, Batavia; males (8), 23 July, 1916, Ithaca; male, 13 Aug., 1916, Cattaraugus County (H. H. Knight).

C. digitulus Knight, new species.

Antennae nearly as in *fuscinus* but dorsum more densely clothed with erect, rather bristly pubescence; dorsum dark brownish to blackish while the legs remain uniformly greenish yellow; genital claspers distinctive.

Male: Length 3.4 mm., width 1.6 mm. Head: Width .70 mm., vertex .30 mm.; brownish black. Rostrum, length 1.14 mm., scarcely attaining hind margins of middle coxae, yellowish, apex and basal segment darker.

Antennae: Segment i, length .27 mm., yellowish; ii, 1 mm., yellowish, thickened on apical half but not quite attaining thickness of segment i, clothed with prominent pale pubescence; iii, .48 mm., scarcely equal to thickness of segment ii, yellowish, apical half more brownish; iv, .36 mm., brownish.

Pronotum: Length .67 mm., width at base 1.26 mm.; dark brownish, more nearly black on calli. Scutellum brownish black; erect yellowish pubescence even more prominent than on pronotum. Sternum and pleura brownish black; ostiolar peritreme yellowish to brownish.

Hemelytra: Embolar margins distinctly arcuate; dark brownish with a reddish tinge, embolium more yellowish translucent; cuneus reddish brown; rather densely clothed with erect, somewhat bristly pubescence, and intermixed with closely appressed, silvery tomentose, scale-like pubescence. Membrane rather uniformly fusco-brownish, scarcely paler bordering cuneus.

Legs: Uniformly greenish or yellowish. Venter brownish black, shining, yellowish pubescent; genital claspers distinctive, basal prong of right clasper taking the form of a small finger-like process.

Female: Length 3.5 mm., width 1.7 mm.; very similar to the male in structure and coloration, but the embolar margins slightly more arcuate. Head: Width .73 mm., vertex .34 mm. Antennae: Segment i, length .28 mm.; ii, 1.11 mm., slender, gradually thickened on apical half but not attaining thickness of segment i; iii, .51 mm., thickness nearly equal to apex of segment ii, yellowish to brownish; iv, .37 mm., brownish.

Holotype: Male, 29 July, 1916, Batavia, New York (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Male and female, taken with types. NEW YORK—Male and female, 13 Aug., 1916, Cattaraugus County, alt. 2300 ft. (H. H. Knight). Male, 21 Aug., 1917, Wyandanch (C. E. Olsen). Female, 26 July, 1908, Yaphank (Wm. T. Davis). Male, 1-7 Aug., 1917, Wanakena (C. J. Drake).

C. drakei Knight, new species.

Elongate, more slender than *pumilus*, most closely related to *nigrocephalus* and *setosus*; the female probably brachypterous as in *setosus*.

Male: Length 4.5 mm., width .68 mm. Head: Width .71 mm., vertex .27 mm.; reddish, darker on vertex. Rostrum, length

1.42 mm., reaching to near hind margins of posterior coxae, yellowish, apex blackish, basal segment reddish.

Antennae: Segment i, length .41 mm., yellowish; ii, 1.43 mm., slender, only very slightly thickened apically, yellowish, fusco-brownish on apical half; iii, .88 mm., about equal in thickness to segment ii, dark fusco-brownish; iv, .51 mm., fuscous.

Pronotum: Length .57 mm., width at base 1.14 mm.; rich brown, becoming piceous on calli, punctures show black; sparsely clothed with long erect, yellowish pubescent hairs. Scutellum dark brown, beset with about sixteen erect yellowish hairs, and between with short, closely appressed, sericeous scale-like pubescence. Sternum and pleura reddish to brownish black; ostiolar peritreme pale reddish.

Hemelytra: Embolar margins nearly straight; yellowish brown translucent, punctures black; each puncture with a short, closely appressed, silvery, sericeous pubescent hair, and interspersed between with rows of sparsely set, erect yellowish hairs; cuneus red, more yellowish on outer margin, beset with rather long yellowish pubescent hairs. Membrane and veins pale, apical half and margins of veins pale fuscous.

Legs: Yellowish brown, bases of coxae reddish, apices of tarsi fuscous. Venter brownish black; right genital clasper with two prongs, nearly forming a semicircle, the hook at base slender and sharply bent, the terminal hook above more broadly curved.

Holotype: Male, 1-7 Aug., 1917, Wanakena, N. Y. (C. J. Drake); author's collection. Paratype: Male, 3 Aug., 1920, The Plains, N. Y. (Osborn and Drake). ALBERTA—Male, 24 July, 1921, Nordegg (J. McDunnough).

Ceratocapsus nigrocephalus Knight, new species.

Elongate, slender, black, legs and hemelytra yellowish, apical half of corium and of cuneus pale fuscous; sparsely clothed with erect pilose hairs.

Male: Length 4.5 mm., width 1.48 mm. Head: Width .73 mm., vertex .31 mm.; black, median line of vertex slightly impressed, somewhat alutaceous. Rostrum, length 1.36 mm., reaching to middle of hind coxae, dark brownish.

Antennae: Segment i, length .37 mm., thickness .086 mm., yellowish, fuscous at base; ii, 1.53 mm., linear, slightly thicker apically (.07 mm. thick), yellowish to dusky, darker apically; iii, .88 mm., linear, thickness .06 mm., fuscous; iv, .60 mm., thickness .06 mm., fuscous.

Pronotum: Length .57 mm., width at base 1.12 mm.; black, shining, lateral margins of disk very slightly sulcate; calli apparent as slightly raised ovals, coarsely alutaceous; sparsely clothed with moderately long, erect pubescent hairs. Scutellum black, transversely rugulose, sparsely beset with erect pilose hairs. Sternum dark brownish to black, shining; pleura brownish to blackish;

ostiole yellowish, dorsal lobe strongly protruding, fuscous just above.

Hemelytra: Embolar margins nearly straight; yellowish translucent, apical half of corium and the cuneus darkened with fuscous; finely pubescent and interspersed with erect, yellowish pilose hairs, pubescent hairs apparently arising from fine punctures. Membrane pale, a large somewhat rounded fuscous cloud occupying central area between areoles and including the apical half.

Legs: Pale yellowish brown, front coxae reddish to fuscous. Venter reddish brown to blackish, darker distally, shining, clothed with yellowish pubescence; genital claspers distinctive.

Female: Length 5 mm., width 1.43 mm.; slightly more robust than the male but very similar in coloration, embolar margins more arcuate distally.

Holotype: Male, 15 July, 1915, Parry Sound, Ontario, Canada (H. S. Parish); author's collection. Allotype: same data as the type. Paratypes: Male, taken with types. MICHIGAN—Male, 22 July, 1916, Pentwater (E. Liljeblad). NEW HAMPSHIRE—Female, Franconia (Mrs. A. T. Slosson). QUEBEC—Male, 11 July, 1920, Cascades (H. G. Crawford). SOUTH DAKOTA—Male, 16 July, 1920, Brookings (H. C. Severin).

C. setosus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 70, 1909.

Female: Length 2.5 mm., width 1.3 mm.; dark brownish with yellowish; distinguished by the small size and oval shape; hemelytra shorter than the abdomen, membrane absent, tips broadly rounded, finely and closely punctured, clothed with short, closely appressed, sericeous pubescence and interspersed with long erect setose hairs.

Male: Length 3 mm., width 1.3 mm.; wings fully developed, suggestive of *pumilus* but smaller; distinguished by the small size and erect setose hairs on dorsum.

New Jersey, Maryland, North Carolina.

Pamillia Uhler.

P. davisii Knight, new species.

Distinguished from *behrensii* by the glabrous and strongly shining area on apical one-third of corium, also by the dark reddish brown color.

Female: Length 3.8 mm., width 1.5 mm. Head: Width .86 mm., vertex .44 mm.; front more nearly flat and more sharply declivitous than in *behrensii*, in form very similar to certain species of *Pilophorus*; dark reddish brown, nearly black on vertex, front and vertex alutaceous, lower half of face more strongly shining; finely pubescent, a few longer hairs on front. Rostrum, length 1.36 mm., scarcely attaining hind margins of intermediate coxae, dark reddish brown.

Antennae: Segment i, length .26 mm., with two or three bristles on anterior aspect, testaceous; ii, 1 mm., more slender at base and gradually enlarged apically (.11 mm. thick) to equal thickness of segment i, yellowish brown, darker brown apically; iii, .61 mm., exceeding thickness (.13 mm. thick) of segment ii, more slender on basal one-fourth, dark brown; iv, .61 mm., equal in thickness to segment iii, fusiform, dark brown; closely covered with very fine, short, golden pubescence.

Pronotum: Length .86 mm., width at base 1.11 mm., anterior angles .72 mm., sides sulcate, anterior half approaching cylindrical form, rather abruptly flaring to basal angles; basal half of disk strongly convex, declivitous behind, basal margin regularly arcuate and fitting far down over mesonotum; collar very fine and narrow, nearly covered by sharp basal margin of head; calli not apparent, disk finely alutaceous, minutely and sparsely pubescent, a few prominent hairs near anterior angles. Scutellum flattened, dark brown, transversely rugose except apical one-third which is opaque; not distinctly separated from the strongly arched and shining mesonotum. Sternum reddish brown, shining, metaepisterna pruinose as viewed in certain lights; ostiolar peritreme pale, projecting slightly at dorsal extremity of the prominent ostiole.

Hemelytra: Greatest width 1.5 mm., embolar margins parallel on basal half (width 1.14 mm.) then abruptly flaring but rounding to base of cuneus; embolium and apical one-third of corium glabrous, convex and strongly shining, dark brown to piceous, basal half of embolium amber brown and translucent; corium, just before glabrous area and apically on clavus, blackish, opaque, a paler brownish, pruinose, transverse band across middle; basal half of clavus reddish to cinnamon brown, opaque; sparsely set with erect short black bristles. Cuneus sharply deflected, strongly shining, practically glabrous, fracture deep, broader at base than long, outer margin arcuate. Membrane dark brownish black, paler at apex, veins inconspicuous; larger areole slender, paralleling inner margin of cuneus, smaller areole scarcely discernible.

Legs: Reddish brown, trochanters and tips of coxae paler, tarsi infuscated, pale basally; pubescent, tibiae with three rows of distinct spines; hind femora slightly flattened and bent as if to fit against sides of venter; arolia free and converging apically.

Venter: Dark brownish to piceous, strongly shining, third segment pruinose on ventral surface; distinctly broader on apical half, finely and rather sparsely yellowish pubescent.

Holotype: Female, 4 Sept., Lakehurst, N. J. (Wm. T. Davis); author's collection. Paratype: Female, 15 Sept., 1902, Manumuskim, N. J.

Named in honor of the collector, Mr. Wm. T. Davis, who had favored the author with several rare and interesting Miridae.

Tribe PILOPHORINI.

Key to Genera.

1. Vertex compressed posteriorly, slightly overlapping the pronotum; length of antennal segment i not exceeding width of vertex; posterior tibiae usually compressed 2
 Vertex not compressed posteriorly; length of antennal segment i nearly equaling width of head; posterior tibiae cylindrical; anterior half of pronotum constricted, its sides at that point nearly parallel (p. 537) *Pseudoxenetes*
2. Antennal segment ii scarcely thickened toward apex; width of head across eyes greater than the width of pronotum at base; hemelytra with embolar margins parallel, destitute of white pubescent bands (p. 537) *Alepidia*
 Antennal segment ii thickened toward apex; width of head less than width of pronotum at base; hemelytra medially coarctate, bearing white pubescent bands (p. 538) *Pilophorus*

Pseudoxenetes Reuter.*P. scutellatus* (Uhler). (Pl. xvi, 13.)

Trans. Md. Acad. Sci., i, 81, 1890.

Length 6.5 mm., width 1.2 mm.; black, scutellum yellow except narrow base, cuneus with white translucent band at base; posterior coxae pale, legs dark brownish, the anterior and middle tibiae more yellowish.

Food plants: *Quercus Muhlenbergii*, *Q. alba*, and occasionally *Fraxinus*.

New Haven, 21 June, 1909 (B. H. W.); 12 June, 1910 (A. B. C.).

P. scutellatus (Uhler). (Pl. xvi, 13.)

Trans. Md. Acad. Sci., i, 80, 1890.

Length 6.5 mm., width 2 mm.; very similar to *scutellatus* but having the scutellum black; basal half of pronotum, sternum, and the pleura largely red.

Occurs on live oak (*Quercus virginiana*).

Long Island, N. Y.

Alepidia Reuter.*A. gracilis* (Uhler).

Hemip. Colo., 42, 1895.

Length 4.2 mm., width 1.3 mm.; black, slightly shining; hemelytra ferruginous black, membrane uniformly infuscated, pale bordering the cuneus; antennae and legs pale yellowish, the femora sometimes darkened; abdomen each side near base with a patch of silvery scales.

Breeds on *Pinus resinosa*.

Long Island, N. Y.

Pilophorus Westwood.

Key to Species.

1. Scutellum strongly convex, almost conically produced 2
Scutellum nearly flat or only moderately convex 4
2. Hemelytra cinnamon brown to fulvous, the polished apical area only, dark brown or piceous 3
Hemelytra dark brownish black, apex of clavus as well as corium polished behind posterior silvery line; silvery bar on clavus nearly or quite connecting with posterior silvery line of corium, directed somewhat obliquely distad; length 4.1 mm. (p. 539) *furvus* n. sp.
3. Antennal segment ii in length equal to little more than width of vertex; smaller, length 3 mm. *heidemanni*
Antennal segment ii in length almost equal to width of head; larger, length 3.5 mm. (p. 539) *depictus* n. sp.
4. Hemelytra polished over entire width behind posterior silvery line 5
Hemelytra polished behind posterior silvery line but exterior to radial vein only 11
5. Hemelytra beset with erect, short black bristles 6
Hemelytra clothed only with fine recumbent pubescence, sometimes black but not erect and bristle-like 7
6. Antennal segment iii black, nearly as thick as segment i
(p. 540) *vanduzeei* n. sp.
Antennal segment iii pale, the apical half only infuscated, slender, scarcely thicker than segment iv (p. 541) *uhleri* n. sp.
7. Hemelytra yellowish brown to dark brown except behind posterior silvery line 8
Hemelytra bright cinnamon fulvous except behind posterior silvery line 9
8. Antennal segment iii pale, scarcely infuscated at apex; hind tibiae strongly compressed, almost carinate (p. 542) *crassipes*
Antennal segment iii reddish brown to piceous, slightly paler at base; hind tibiae only very slightly compressed *cinnamopterus*
9. Small, length not exceeding 3.7 mm.; posterior silvery line interrupted on corium but not dislocated at claval suture 10
Larger, length 4.5 mm.; posterior silvery line not interrupted on corium but slightly dislocated at claval suture; antennal segment ii gradually thickened toward apex (p. 542) *amoenus*
10. Antennal segment ii strongly clavate on apical one-third, in length exceeding distance between tip of tylus and hind margin of pronotum (p. 543) *laetus*
Antennal segment ii gradually thickened from middle toward apex, in length not equal to distance between tip of tylus and base of pronotum (p. 543) *juniperi* n. sp.
11. (4) Transverse silvery line of clavus and corium dislocated at claval suture 12
Transverse silvery line of clavus and corium forming nearly a straight line, although that of the clavus bent slightly forward but never disconnected (p. 544) *perplexus*
12. Antennal segment ii, in length, equal at least to distance between tip of tylus and basal margin of pronotum 13
Antennal segment ii, in length, not equal to distance between tip of tylus and basal margin of pronotum; length 3.5 mm. *walshi*
13. Antennal segment ii, in length, equal to or only slightly greater than distance between tip of tylus and basal margin of pronotum; clavus of the same brown color as corium; smaller, length 4 mm. (p. 544) *brunneus*
Antennal segment ii, in length, distinctly greater than distance between tip of tylus and basal margin of pronotum; clavus distinctly darker bordering scutellum and commissure; larger, length 4.5-5 mm. (p. 544) *clavatus*

P. furvus Knight, new species.

Female: Length 4.1 mm., width 1.61 mm. Head: Width 1.12 mm., vertex .61 mm., basal margin to tip of tylus .89 mm.; dark reddish brown to piceous, smooth, shining; gula beset with erect, bristly pubescent hairs. Rostrum, length 1.4 mm., scarcely attaining hind margin of sternum, rufo-piceous.

Antennae: Segment i, length .25 mm.; ii, 1.03 mm., thickness (.08 mm.) equal to segment i, more slender on basal one-fourth, minutely pubescent, dark reddish brown, slightly paler at base; iii, .41 mm., slender, pale, apical half dark brown; iv (missing).

Pronotum: Length .83 mm., width at base 1.33 mm., anterior angles .77 mm.; lateral margins sulcate, flaring sharply to basal angles, a distinct bristle just before each anterior angle; uniformly dark brownish black; xyphus convex, lateral margins scarcely carinated, reddish brown. Scutellum strongly convex, almost taking the form of a truncate pyramid but rounded above, apex flattened, basal angles and apex with a tuft of silvery scale-like pubescence; mesonotum broadly exposed, flattened above but abruptly declivitous at each side. Sternum brownish black, polished; epimera with posterior margin covered by silvery scale-like pubescence; ostiolar peritreme pale to dusky, polished just above, a tuft of scale-like pubescence at posterior margin of meta-episternum just beneath that on embolium.

Hemelytra: Embolar margins sulcate-sinuate, greatest width (1.61 mm.) just before cuneal fracture; from anterior to posterior silvery line, opaque, dark brownish black; behind posterior silvery line, brownish black to piceous, polished, apex of clavus and all of the cuneus included; posterior silvery line sinuate, perhaps interrupted (mutilated?), nearly or quite connecting with that of clavus which is directed slightly distad; basal silvery line similar to that of *amoenus*; very finely pubescent, longer on apical margin bordering membrane. Cuneus sharply deflected, piceous and polished similar to apex of corium, a silvery scale-like spot near inner basal angle. Membrane pale fuscous, a large opaque blackish cloud involving apical half of areoles and middle of membrane.

Legs: Dark brownish black, tibiae more yellowish brown, trochanters except on front legs, two basal segments of tarsi, and apical half of hind coxae, pale.

Venter: Dark brown to piceous, polished, finely pubescent, prominent bristly hairs bordering ovipositor.

Holotype: Female, 30 June, Lakehurst, N. J. (Wm. T. Davis); author's collection.

Pilophorus depictus Knight, new species.

Closely related to *furvus* but smaller, length of antennal segment ii scarcely equaling width of head; hemelytra, anterior to posterior silvery line, cinnamon fulvous as in *amoenus*.

Female: Length 3.5 mm., width 1.53 mm. Head: Width 1.05 mm., vertex .55 mm., from basal margin to tip of tylus .84 mm.; dark brownish to piceous, more brownish on juga and lora, polished, gula beset with erect bristles as in *furvus*. Rostrum, length 2 mm., reaching to middle of intermediate coxae.

Antennae: Segment i, length .25 mm., brownish; ii, .1 mm., greatest thickness .096 mm., more slender on basal one-third, black, basal one-fourth brownish, minutely pubescent; iii, .44 mm., slender, fuscous, basal one-third pale; iv, .38 mm., fuscous, slightly paler at base.

Pronotum: Length .77 mm., width at base 1.25 mm.; dark brownish black, shining. Scutellum almost identical with *furvus* in structure, a silvery bar in each basal angle, with a transverse one on the flattened apical one-third. Sternum brownish black to piceous, polished; ostiolar peritreme pale to brownish; episternum brown, darker at basal angle bordering the silvery scale-like spot.

Hemelytra: Embolar margins nearly parallel on basal half, equal in width to base of pronotum, apical half with margin flaring to widest (1.53 mm.) just before cuneal fracture; from anterior to posterior silvery line, cinnamon fulvous in color as in *amoenus*, shaded with fuscous on anterior side bordering anterior silvery line, also a dusky spot at base of clavus, minutely golden pubescent; posterior silvery band broken into three spots, silvery bar on clavus directed somewhat obliquely distad; piceous and polished behind posterior silvery band, the cuneus included. Cuneus and membrane nearly as in *furvus*, the blackish opaque cloud larger and involving nearly all of larger areole.

Legs: Dark brownish black, tibiae uniformly colored as the femora, apical half of hind coxae, and the trochanters, white; two basal segments of tarsi, tips of femora, spot on front of anterior coxae, and middle trochanters, pale.

Venter: Similar to *furvus*, apparently the sides never with silvery, scale-like pubescence.

Holotype: Female, 12 July, 1909, Washington, D. C. (O. Heidemann); Cornell Univ. collection.

Pilophorus vanduzeei Knight, new species.

Male: Length 5 mm., width 1.66 mm. Head: Width 1.25 mm., vertex .66 mm., from tip of tylus to basal margin of head 1.11 mm.; sharp basal margin of vertex beset with six black bristles, front sparsely clothed with silvery, deciduous, scale-like pubescent hairs, and interspersed with erect bristles. Rostrum, length 2.27 mm., scarcely attaining hind margins of middle coxae.

Antennae: Segment i, length .44 mm., thickness .11 mm.; ii, 2.22 mm., gradually thickened from base toward apex (.15 mm. thick), dark brownish black, clothed with short black pubescence; iii, .80 mm., thickness .08 mm., uniformly black; iv, .72 mm., pale, infuscated apically.

Pronotum: Length .94 mm., width at base 1.53 mm., anterior angles .83 mm.; anterior half of disk sparsely clothed with silvery, deciduous, pubescent hairs similar to those on front of head. Scutellum with apical half and slender lateral margins flat, abruptly convex on basal half but flattened basally, flattened apical half more or less covered with silvery, scale-like pubescence.

Hemelytra: Dark fusco-brownish, opaque anterior to posterior silvery line, basal half with a silvery sheen apparent in certain lights; beset with erect, short black bristles; posterior silvery line nearly straight, slender, behind this distinctly polished, apex of clavus included. Membrane uniformly darkened with fuscous, an opaque black cloud bordering apex of larger areole.

Legs: Uniformly brownish black, a pale spot on anterior aspect of front coxae near base; hind tibiae strongly flattened and distinctly curved. Venter with a patch of silvery, scale-like pubescence laterally on third segment.

Female: Length 5.3 mm., width 1.8 mm.; very similar to the male but antennal segment iii perceptibly thicker (.10 mm. thick), nearly equal to thickness of segment i.

Breeds on *Pinus resinosa*.

Holotype: Male, 11 July, 1920, Taghanic, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (16), taken with the types on *Pinus resinosa*. MASSACHUSETTS—Female, 15 July-6 Aug., 1918, Woods Hole (Chris E. Olsen).

P. uhleri Knight, new species.

Closely related to the preceding species but differs in color and thickness of antennal segment iii, in having patches of silvery scale-like pubescence on sides of fourth and fifth abdominal segments, and by the fact that the hind tibiae are not so distinctly compressed.

Male: Length 5 mm. Head: Width 1.14 mm., vertex .53 mm., from tip of tylus to vertex .94 mm.; front without silvery scale-like pubescence. Rostrum, length 1.8 mm., nearly attaining hind margins of middle coxae.

Antennae: Segment i, length .38 mm., thickness .10 mm.; ii, 1.86 mm., gradually thickened apically (.14 mm. thick); iii, .66 mm., thickness .06 mm., pale, apical half infuscated, sometimes the whole segment tinged with pink; iv, .61 mm., pale, apex dusky.

Pronotum: Length .83 mm., width at base 1.44 mm.; uniformly black, beset with black pubescence but devoid of silvery scale-like hairs. Scutellum nearly as in *vanduzeei* but with sides and base thickly covered with silvery, scale-like pubescence.

Hemelytra: Very similar to *vanduzeei* but the posterior silvery line distinctly broader.

Legs: Hind tibiae slightly compressed but not distinctly flattened as in *vanduzeei*.

Venter: With a distinctive patch of silvery, scale-like pubescence on the sides, extending obliquely across segments 3-6 inclusive.

Female: Length 4.8 mm., width 1.77 mm.; very similar to the male but slightly more robust; antennal segment ii, length 2.15 mm., greatest thickness .166 mm., segment iii pale, apical half infuscated.

Breeds on *Larix laricina* and *Pinus sylvestris*.

Holotype: Male, 30 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: NEW YORK—Males and females (12), 14 July, 1916, Batavia; female, 27 June, males (2) and females (2), 30 June, males (2), 2 July, male and females (2), 5 July, males (2) and females (2), 8 July, Ithaca (H. H. Knight). Male, 4 July, 1919, White Plains (J. R. T. Bueno). ONTARIO—Female, 15 July, 1914, Ottawa (G. Beaulieu).

P. crassipes Poppius.

Ann Soc. Ent. Belg., lviii, 242, 1914.

Male: Length 5.1 mm. Head: Width 1.06 mm., vertex .50 mm. Antennae: Segment i, length .39 mm.; ii, 1.94 mm., gradually thickened apically (.13 mm. thick), dark fusco-brownish, apical half black; iii, .66 mm., pale, infuscated at apex; iv, .61 mm., pale fuscous.

Front of head and the pronotum clothed with fine silvery pubescence while that on the hemelytra is more nearly golden; scutellum clothed with silvery, scale-like pubescence, more thickly on basal angles and apex; hemelytra polished behind posterior silvery line but rather thickly clothed with recumbent golden pubescence; posterior tibiae distinctly compressed; venter with an oblique patch of silvery, scale-like pubescence on sides of segments 3-6 inclusive.

Female: Length 5 mm., width 1.61 mm.; antennal segment ii, length 2.19 mm., greatest thickness .166 mm., more distinctly thickened on apical one-third than in the male.

Breeds on *Pinus strobus*.

New Hampshire, New York.

P. amoenus Uhler.

Ent. Amer., iii, 30, 1887.

Male: Length 5 mm., width 1.64 mm.; hemelytra anterior to posterior silvery line, cinnamon fulvous in color, distad of this, polished and piceous; posterior silvery line nearly straight, not interrupted on corium; hind tibiae distinctly compressed.

Antennae: Segment i, length .39 mm., fuscous; ii, 1.83 mm., greatest thickness .12 mm., gradually thickened from base toward apex, black, fusco-brownish on basal half; iii, .72 mm., slender, pale; iv, .64 mm., pale, dusky on apical half.

Female: Length 4.8 mm., width 1.7 mm.; very similar to the male in structure and coloration. Antennae: Segment i, .39 mm.; ii, 1.72 mm., greatest thickness .14 mm., slightly thicker on apical half than in the male; iii, .72 mm., pale; iv, .64 mm., pale, dusky apically.

Breeds on *Pinus virginiana*.

Massachusetts, Long Island, N. Y.

P. laetus Van Duzee.

Proc. Cal. Acad. Sci., ser. 4, viii, 294, 1918.

Male: Length 3.7 mm., width 1.27 mm.; coloration similar to that of *amoenus*; posterior silvery line interrupted on corium. Antennae: Segment i, length .28 mm., brownish; ii, 1.39 mm., slender, pale, abruptly clavate (.13 mm. thick) and black on apical one-third; iii, .53 mm., pale, dusky at apex; iv, .55 mm., dusky.

Female: Length 3.7 mm., width 1.33 mm.; very similar to the male in structure and coloration, but clavate portion of antennal segment ii very slightly thicker (.15 mm. thick).

Breeds on *Pinus virginiana*.

Allotype: Male, 10 Aug., Washington, D. C. (O. Heidemann); author's collection.

Pilophorus juniperi Knight, new species.

Very similar to *laetus* but darker in coloration; differs in the shorter and more gradually thickened antennal segment ii, and by the narrower head.

Male: Length 3.7 mm., width 1.3 mm. Head: Width .91 mm., vertex .49 mm.; dark brownish black, more brownish below. Rostrum, length 1.06 mm., attaining middle of intermediate coxae, brownish black.

Antennae: Segment i, length .28 mm., brownish; ii, 1.11 mm., gradually thickened from middle toward apex (.10 mm. thick), in length not equal to distance between tip of tylus and base of pronotum, brown, apical half black; iii, .44 mm., pale, infuscated apically; iv, .42 mm., infuscated.

Pronotum: Length .71 mm., width at base 1.11 mm.; dark brownish black, sides more gradually sulcate than in *laetus*. Scutellum nearly as in *laetus* but not so strongly convex on disk.

Hemelytra: Nearly as in *laetus* but darker in color. Membrane blackish on basal half, pale fuscous on apical half and bordering cuneus.

Legs: Dark fusco-brownish, distinctly darker than in *laetus*.

Venter: Dark brownish black, each side with a patch of silvery hairs on segments 3-5 inclusive.

Female: Very similar to the male in structure and coloration.

Breeds on *Juniperus virginiana*.

Holotype: Male, 18 July, 1915, White Plains, N. Y. (J. R. T. Bueno); author's collection. Allotype: same data as the type. Paratypes: MARYLAND—Female, June, 1913, Forest Glen; male, 30 June, 1905, Plummers Island (O. Heidemann). MASSACHUSETTS—Male, 15 July-6, Aug., 1918, Woods Hole (C. E. Olsen). MINNESOTA—Males and females (17) 20 July, 1920, Gray Cloud Island, Ramsey County (H. H. Knight), collected on *Juniperus virginiana*. NEW JERSEY—Female, 25 July, 1911, Bear Swamp, Ramapo Mts. (Wm. T. Davis). NEW YORK—Males (2), 18 July, male, 24 July, male and female, 27 July, White Plains (J. R. T. Bueno), collected on *Juniperus virginiana*.

P. perplexus Douglas and Scott.

Pilophorus perplexus Douglas and Scott, Ent. Mon. Mag., xii, 101, 1875. Saunders, Hem. Het. Brit. Isds., 265, 1892.

Male: Length 4 mm., width 1.38 mm.; hemelytra nearly uniformly brown, clothed with minute golden pubescence; very similar to *brunneus* but distinguished by the continuous, transverse posterior silvery band; scutellum, thorax, and head, dark brown to blackish. Antennae: Segment i, length .30 mm., brownish; ii, 1.44 mm., scarcely thicker (.09 mm. thick) than segment i, slightly more slender on basal one-third, brownish, dark brown on apical half, minutely pubescent; iii, .58 mm., pale, apical half infuscated; iv, .53 mm., infuscated, pale at base.

Female: Length 4 mm., width 1.5 mm.; very similar to the male but slightly more robust. Antennae: Segment i, length .30 mm.; ii, 1.47 mm., greatest thickness .11 mm., gradually thickened from base toward apex; iii, 1.11 mm.; iv, .50 mm.; colored similarly to the male.

In New York the writer collected specimens on goldenrod (*Solidago*). Specimens upon which this record is based have been compared with European material of *perplexus* D. & S. and found to be identical. The writer also has at hand European specimens of *cinnamopterus* Kirsch but as yet no American representatives have been examined.

Storrs, 5 Aug., 1920 (M. P. Z.).

P. brunneus Poppius.

Ann. Soc. Ent. Belg., lviii, 244, 1914.

Male: Length 4 mm., width 1.37 mm., from tip of tylus to basal margin of pronotum 1.38 mm.; very similar to *walshi* but slightly larger and darker colored, more nearly the size and color of *perplexus* but the silvery line on clavus dislocated and set slightly forward. Antennae: Segment i, length .28 mm., fusco-brownish; ii, 1.47 mm., dark brownish, more nearly black at apex; iii, .61 mm., fuscous, basal one-fourth pale; iv, .61 mm., fuscous, narrowly pale at base.

Female: Length 3.6 mm., width 1.36 mm., from tip of tylus to basal margin of pronotum 1.33 mm.; more robust than the male but similar in coloration; antennal segment ii, length 1.33 mm., slightly thicker toward apex but scarcely exceeding thickness of segment i.

Occurs on *Salix*.

New York.

P. clavatus (Linnaeus).

Cimex clavatus Linnaeus, Syst. Nat., Edn. 12, i, 729, 1767.

Reuter, Hem. Gymn., Eur., iv, 114, tab. 4, fig. 3, 1891.

Male: Length 4.6 mm., width 1.53 mm., from tip of tylus to basal margin of pronotum 1.5 mm.; brownish black, hemelytra

brown, clavus darker than corium except bordering claval suture. Antennae: Segment i, length .33 mm., fusco-brownish; ii, 1.75 mm., greatest thickness .11 mm., gradually thickened from base toward apex, slightly exceeding thickness of segment i, dark brownish black, more nearly black on apical half; iii, .66 mm., fuscous, more nearly pale on basal half; iv, .39 mm., fuscous, paler at base.

Female: Length 4.6 mm., width 1.67 mm., from tip of tylus to basal margin of pronotum 1.55 mm.; very similar to the male in form and coloration; antennal segment ii, length 1.75 mm., thickness and coloration similar to that of male.

Occurs on *Quercus*.

New York, Minnesota.

Tribe SYSTELLONOTINI.

Sericophanes Reuter.

S. heidemanni Poppius.

†*Sericophanes ocellatus* Osborn, Proc. Iowa Acad. Sci., v, 238, fig. 16, 1898.

Sericophanes heidemanni Poppius, Ann. Soc. Ent. Belg., lviii, 260, 1914.

Sericophanes noctuans Knight, Ent. News., xxviii, 4, 1917.

Male: Length 3.4 mm., width 1 mm.; color dark chestnut to black, legs yellowish brown, tibiae darker, posterior coxae pale; antennae yellowish brown, darker on segments iii and iv, segment iv slightly compressed; hemelytra velvety brown, darker on base of clavus, two transverse irregular silvery sheen bars over the brown, a cream-colored round spot on the clavus just beyond scutellum; membrane lightly infumed, pale bordering apical one-third of cuneus.

Female: (brachypterous): Length 3.1 mm., width of abdomen .97 mm.; ant-like in form, yellowish brown, prothorax subglobose; hemelytra much reduced, only reaching to base of third abdominal tergite, cream-colored spot present just beyond scutellum; abdomen nearly subglobose, pleural margin prominent, segments 4-7 dark brownish to piceous, paler beneath bordering ovipositor.

Macropterous and brachypterous females are described and figured by Osborn (1898); found to occur on grassy ridges.

Males are frequently collected at light. In New York, Dr. C. P. Alexander reports this species as flying up in large numbers from the grass after sundown.

New Haven, 26 July, 1910, 30 May, 1911, 28 June, 7 July, 1920 (B. H. W.).

Subfamily MIRINAE.

Key to Genera.

- | | |
|--|---|
| 1. Pronotum distinctly swollen at the middle, as wide there or wider than at the hind margin | 2 |
| Pronotum widest at the base, not noticeably swollen at the middle | 3 |

2. Antennal segment i shorter than width of vertex; pronotum not extending back to basal angles of hemelytra; base of scutellum poorly defined (p. 546) **Pithanus**
Antennal segment i, in length, greater than width of vertex; pronotum extending back to basal angles of hemelytra; hemelytra usually depressed near base and tip of scutellum, arched over middle of abdomen (p. 546) **Mimoceps**
3. Head strongly exserted, eyes placed near middle and thus far removed from anterior margin of pronotum (p. 547) **Collaria**
Head not or only slightly exserted; eyes usually in contact with pronotum or nearly so 4
4. Pronotum impunctate or nearly so 5
Pronotum coarsely and deeply punctured 7
5. Antennal segments clothed with very fine pubescence; body nearly glabrous, at most with very short pubescence 6
Antennal segments thickly covered with erect black hairs; body covered with fine long erect pubescence; eyes slightly removed from anterior angles of pronotum (p. 547) **Miris**
6. Head short and greatly flattened, front scarcely protruding beyond base of antennae; median sulcus of head replaced by a broad and shallow basin; antennal segment i slender and curved, thickest near base, tapering to slender then slightly enlarged at apex (p. 547) **Teratocoris**
Head long and pointed, front projecting sharply beyond base of antennae; median sulcus deep; antennal segment i not so long and attenuate as the above (p. 548) **Trigonotylus**
7. (4) Segment i of antennae with very short pubescence, practically glabrous; pronotum and scutellum sparsely covered with deep punctures (p. 549) **Mesomiris**
Segment i of antennae thickly covered with long pubescent hairs; punctures of pronotum and scutellum deep and closely placed ... (p. 549) **Stenodema**

Pithanus Fieber.

P. maerkelii (Herrich-Schaeffer).

Capsus maerkelii Herrich-Schaeffer, Wanz. Ins., iv, 78, fig. 406, 1839.

Saunders, Hemip. Het. Brit. Isds., 219, pl. 20, fig. 1, 1892.

Length 3-3.8 mm., width hemelytra 1.2 mm., width abdomen 1.5 mm.; black, lateral margins of the short hemelytra and apex of first antennal segment pale; legs and rostrum chiefly yellowish brown, darker spots evident on the femora.

Occurs on grasses.

Maine, Long Island, N. Y.

Mimoceps Uhler.

M. gracilis Uhler.

Trans. Md. Acad. Sci., i, 85, 1890.

Length 4 mm., width 1.2 mm.; black, legs, rostrum, and antennae, reddish yellow, paler at the joints; hemelytra shorter than the abdomen, yellow at base, black bar on the middle and pale apically.

Occurs on sedges.

New York.

Collaria Provancher.**C. meilleurii** Provancher.

Nat. Can., iv, 79, 1872; Pet. Faune Ent. Can., iii, 102, 1886.

Length 6-7 mm., width 1.7 mm.; black, front of head shining; legs yellowish brown, femora with small black spots; hemelytra yellowish translucent, clavus and irregularly on apical half of corium, fuscous to black; calli strongly convex, nearly as high as the base of pronotum; posterior angles of pronotum with two opaque black spots but scarcely noticeable on the black background; antennae longer than the body.

Occurs on *Calamagrostis canadensis* and other grasses in damp situations.

Colebrook, 21 July, 1905 (H. L. V.).

C. oculatus Reuter.

Ofv. Kongl. Sv. Vet.-Akad., xxxii, No. 9, 61, 1876.

Length 6-6.8 mm., width 1.7 mm.; brownish with fuscous; very similar to *meilleurii* but the calli less convex and the opaque black spots prominent on a brown background; hemelytra chiefly brown.

Occurs on grasses in dry sandy meadows.

Cheshire, 8 July, 1904 (H. L. V.); New Haven, 1 June, 1904 (W. E. B.); 8 July, 1911 (B. H. W.).

Miris Fabricius.**M. dolabratus** (Linnaeus). (Pl. xvi, 23.)

Cimex dolabratus Linnaeus, Syst. Nat., Edn. 10, i, 449, 1758.

Saunders, Het. Brit. Isds., 227, pl. 20, fig. 10, 1892.

Length 7.3-8.5 mm., width 2.4 mm.; pale greenish with fuscous and black; brachypterous females common; pronotum with two black stripes which run over the scutellum; vestiture of fine long erect pubescence; males frequently with hemelytra tawny brown.

Food plants: Blue grass (*Poa pratensis*), timothy, and frequently other grasses.

Branford, 27 June, 1904 (H. L. V.); Brooksville, 30 June, 1902 (W. E. B.); New Haven, 16, 24 June, 1902 (E. J. S. Moore); 8 June, 1904 (W. E. B.); 9 June, 1914 (Q. S. Lowry); 1 July, 1914 (M. P. Z.).

Teratocoris Fieber.**T. discolor** Uhler.

Ent. Amer., iii, 68, 1887.

Length male 4.8 mm., width 1.2 mm.; female, length 6.2 mm., width 1.6 mm.; fuscous to black, with basal angles of pronotum, base of hemelytra and full length of embolium, pale or greenish; legs and antennae reddish; female with hemelytra and venter much paler than in the male, only slightly fuscous along the claval

suture and inner angles of the corium; hemelytra sometimes reddish to fuscous.

Occurs on sedges; frequently attracted to lights.

Massachusetts, New York.

T. paludum J. Sahlberg.

Acta Soc. Faun. Fl. Fenn., i, 28, 1875.

Length 5.2-5.6 mm., width 1.2-1.5 mm.; green; antennal segment i except basally, and segment ii, red, segments iii and iv fuscous; hind tibiae red, apices of femora more or less red.

Occurs on *Carex vesicaria* in Finland; also taken on the same plant in Minnesota by the writer; frequently attracted to lights.

Minnesota, New York.

Trigonotylus Fieber.

Key to Species.

1. Head not distinctly elongated between the eyes and base of antennae; eyes usually prominent as seen from above, oval or nearly round 2
- Head distinctly elongated between front margin of eyes and base of antennae, the sides at this point parallel; eyes as seen from above not at all prominent, distinctly longitudinal. Very small slender species, hind tibiae and tarsi reddish, antennae pink **confusus**
2. Apices of posterior tibiae, and the tarsi, black **tarsalis**
- Apices of posterior tibiae not black, tarsi usually reddish 3
3. Antennal segment i, in length, not greater than distance between basal margin of pronotum and a line drawn through middle of eyes 4
- Antennal segment i longer, length equal to distance between basal margin of pronotum and a line drawn through point of insertion of antennae; eyes elongate oval; pronotum with four longitudinal pale orange stripes, the same often noted on the scutellum and hemelytra **uhleri**
4. Hind tarsi with segment i slightly longer than remaining two united (measured on ventral surface); pronotum usually with longitudinal fuscous stripes; antennae reddish (at least ordinarily) **ruficornis**.
- Hind tarsi with segment i slightly shorter than remaining two united; body and antennae uniformly pale **brevipes**

T. confusus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 6, 1909.

Length 4.3-5 mm., width .7 mm.; well described in the key.

Maryland.

T. tarsalis Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 60, 1876.

Length 5.4-6.2 mm., width 1.5 mm.; pale green to bright green; apices of posterior tibiae, and the tarsi, black; antennae usually reddish from middle of segment ii to apex of segment iv.

Breeds on slough grass (*Spartina michauxiana*).

Colebrook, 20 July, 1905 (W. E. B.).

T. uhleri Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 60, 1876.

Length 6.2-7.5 mm., width 1.5 mm.; species well described in the key.

Stratford, 29 June, 1908 (W. E. B.); 9 July, 1920 (B. H. W.); Woodmont, 9 July, 1904 (P. L. B.).

T. ruficornis (Geoffroy).

Cimex ruficornis Geoffroy in Fourcroy, Ent. Paris., 209, 1785.

Douglas and Scott, Brit. Hemip., 290, 1865.

Length 5.5-6 mm., width 1.2 mm.; usually distinguished by having the antennae reddish from base to apex; pronotum usually with four fuscous stripes with a slender pale line between the two middle stripes.

Food plants: Cultivated oats and closely related wild grasses.

Branford, 21 June, 1904 (H. L. V.); Colebrook, 20 July, 1905 (W. E. B.).

Mesomiris Reuter.**M. curtulus** Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 4, 1909.

Length 5-5.5 mm., width 1.5 mm.; yellowish brown to dark brown; dorsum rather sparsely punctured with deep coarse punctures; antennae with very short fine pubescence; antennae, legs, and venter, sometimes with reddish brown.

New Haven, 25 July, 1919 (M. P. Z.).

Stenodema Laporte.**S. trispinosum** Reuter. (Pl. xvi, 22.)

Ofv. Finska Vet.-Akad., Forh., xlv, No. 15, 3, 8, 1904.

Length 7-7.5 mm., width 1.7 mm.; pale yellowish to greenish, hemelytra sometimes bright green; distinguished by the three spines near apex on posterior margin of hind femora, one of the three spines much reduced in size.

Occurs on grasses in moist meadows; adults hibernate.

Hamden, 20 May, 1920 (M. P. Z.); New Haven, 10 May (A. B. C.), 30 May (B. H. W.), 1911; 6 July, 1904, 16 Oct., 1903 (H. L. V.); Putnam, 12 July, 1905 (H. L. V.).

S. vicinum (Provancher).

Nat. Can., iv, 77, 1872.

Length 7-7.5 mm., width 1.7 mm.; yellowish to greenish with fuscous; femora devoid of spines; a median pale stripe with fuscous each side, extending from tylus back over pronotum and scutellum to the hemelytra; clavus and inner half of corium dark fuscous to blackish in the male; antennal segment ii, and the apical segments, more or less reddish.

Occurs on grasses in moist meadows; adults hibernate.

Branford, 11 May (H. W. W.), 28 July (H. L. V.), 1905; Canterbury, 14 Aug., 1905 (B. H. W.); Cornwall, 29 May (K. F. C.); New Haven, 10 May, 1911 (A. B. C.); 6 July (H. L. V.), 20 July (W. E. B.), 1904.

Subfamily CAPSINAE.

Key to Tribes.

1. Slender ant-like species, abdomen constricted at base; lateral margins of pronotum indistinct, more or less sinuate; hemelytra medially coarctate (p. 655) **Myrmecorini**
- Form not ant-like, abdomen not distinctly constricted; pronotum with lateral margins distinct, frequently finely carinate; hemelytra with embolar margins straight or slightly arcuate 2
2. Ostiolar peritreme small, poorly developed, its dorsal margin scarcely extending dorsad as far as ventral margin of epimeron of mesothorax; tibiae destitute of spines but sometimes strongly nigro-pubescent; body impunctate; pronotal collar broad, strongly convex, width of collar (measured cephalo-caudally) usually as great as width of calli; genae high, head vertical, rarely inclined; segment i of hind tarsi twice as long and thicker than the second (p. 550) **Resthenini**
- Ostiolar peritreme prominent, its dorsal margin extending well above ventral margin of epimeron of mesothorax; tibiae bearing rows of spines, sometimes rather fine; dorsum frequently punctate; pronotal collar not so broad and prominent as the above; genae of medium height or low, rarely high but in such case the vertex, frons and tylus are sub-confluent in a wide arc, the gula long; segment i of hind tarsi rarely longer than segment ii, but if so, never thicker than segment ii (p. 560) **Capsini**

Tribe RESTHENINI.

Key to Genera.

1. Stricture of pronotal collar joining base of coxal cleft; head when viewed from the side oblique, gula rather long, oblique .. **Opistheuria**
- Stricture of pronotal collar interrupted at side, not joining directly with base of coxal cleft; head short, vertical, gula short, scarcely apparent **Platytyllus**

Opistheuria Reuter.

Key to Species and Varieties.

1. Pronotum, and ventral surface except genital segments, orange red; scutellum and hemelytra black, embolium and outer margin of clavus and cuneus, orange red typical **clandestina**
- (a) Pronotal disk largely black; ventral surface except genital segment, orange red variety **dorsalis**
- (b) Pronotal disk largely black; ventral surface chiefly black variety **ventralis**

O. clandestina Van Duzee.

Pomona Jour. Ent. Zool., vii, 110, 1915.

Length 7.4 mm., width 3.3 mm.; embolar margins distinctly arcuate on apical half; color orange-red, antennae, tylus and front,

scutellum, hemelytra except outer margins, and genital segments, black; legs black, coxae reddish, femora more or less pale at base.

New York.

O. clandestina var. dorsalis Knight.

Bull. Brook. Ent. Soc., xii, 115, 1918.

Length 7.1 mm., width 2.8 mm.; black; base of head, juga, lora, genae, sides of pronotum, median vitta on basal half of scutellum, and venter except genital segments, orange colored; bases of middle and posterior femora pale to orange.

This variety is a pest on lima beans in Louisiana.

New York, Ohio.

O. clandestina var. ventralis Knight.

Bull. Brook. Ent. Soc., xiii, 115, 1918.

Similar to variety *dorsalis* except that the venter is fuscous to black; orange color being replaced by yellowish to pale.

New York.

Platytylellus Reuter.

Key to Species.

1. Length of antennal segment i not equal to width of vertex 2
 Length of antennal segment i equal to or greater than width of vertex 3
2. Pronotal disk with median red vitta extending to join with red scutellum; antennal segment i, in length, not equal to more than one and one-half times the lateral width of an eye
 (p. 552) *rubrovittatus*
 Pronotal disk without median red vitta; antennal segment i, in length, equal to twice the lateral width of an eye.. (p. 553) *nigricollis*
3. Pronotum uniformly orange or fulvous, hemelytra black 4
 Pronotum with black, sometimes bright red but in such case the hemelytra red or pale on lateral margins 6
4. Scutellum orange-yellow; tibiae clothed with short hairs, length of hairs not equal to thickness of segment; male genital segment without tubercles 5
 Scutellum black; tibiae thickly clothed with prominent long hairs, length of certain hairs greater than thickness of segment; male genital segment with a prominent tubercle at base of each clasper
 (p. 557) *nigroscutellatus* n. sp.
5. Width of pronotal collar slightly greater than width of head; larger, length 8.7 mm. (p. 556) *insitivus*
 Width of head greater than width of pronotal collar; smaller, length 6.8-8 mm. *insitivus* var. *angusticollis* n. var.
6. Male with a prominent lateral tubercle near base of left genital clasper; pronotal disk uniformly red, or red and black, in the latter case the black always formed along median line but sometimes spreading to cover all but narrow lateral margins; lateral margins of hemelytra frequently red 7
 Male without tubercle near base of left genital clasper; pronotal disk black, or frequently with red but in that case the red color developing along median line, thus leaving a black ray each side or even reduced to form spot near basal margin; lateral margins of hemelytra sometimes red but in that case the median line of pronotum also red 8

7. Hemelytra uniformly black; pronotum red, median line of disk, and including the calli, black, thus leaving lateral margins of disk broadly red (p. 557) *fraternus* n. sp.
 Hemelytra with lateral margins pale or red
 (a) Pronotal disk with broad median ray extending from the black scutellum to anterior margin; calli and spot on dorsal surface of collar, black, variety *rubromarginatus* n. var.
 (b) Pronotum and scutellum uniformly bright red; head, except tylus and the calli, red variety *regalis* n. var. ✓
 (c) Head except tylus, and the calli, red; scutellum black, central area of pronotal disk black, in dark specimens spreading to involve all but lateral margins and the calli .. variety *discifer* n. var. ✓
8. Hemelytra uniformly black 9
 Hemelytra with lateral margins red; pronotal disk red on median line, leaving a black or fuscous vitta at each side, sometimes the vitta reduced to form black spot near basal margin (p. 555) *circumcinctus*
9. Antennal segment i, in length, only slightly greater than width of vertex, not equal to vertex plus one-third dorsal width of an eye; length 7.7 mm., or less 10
 Antennal segment i, in length, equal to width of vertex plus one-third dorsal width of an eye; length 7.9 mm. (p. 555) *rubellicollis* n. sp. ✓
 (a) Scutellum black; collar, xyphus, lower half of propleura, and a short, clearly defined vitta extending from collar back between calli but not beyond middle of disk, orange to pink typical *rubellicollis*
 (b) Scutellum with reddish vitta; vitta on median line of pronotal disk not attaining basal margin of disk variety *vittiscutis* n. var. ✓
 (c) Scutellum with orange or reddish vitta; orange colored vitta on median line of pronotal disk extending from collar to basal margin variety *confluens* n. var.
10. Head red, tylus, and more or less on juga and lora, blackish; pronotum red, basal half of disk with blackish; surface very finely granulate (p. 554) *insignis*
 (a) Venter black, with not more than a red tinge at base; scutellum red, lateral margins blackish; pronotal disk with central area red, broadly invading the black but not as a clearly defined vitta typical *insignis*
 (b) Venter red; scutellum black; basal half of pronotal disk black variety *fraterculus* n. var. ✓
 Head black, basal margin of vertex slenderly red; scutellum black; pronotal collar red but usually blackish above; base of venter red beneath, but the gula never red; surface coarsely granulate (p. 553) *borealis* n. sp.

P. rubrovittatus (Stål).

Stett. Ent. Zeit., xxiii, 318, 1862.

Female: Length 5.3 mm., width 2 mm.; embolar margins moderately arcuate; surface distinctly granulate; black; head except tylus and eyes, basal segment of rostrum, pronotum except a flaring ray on each side of disk extending from callus to basal margin, scutellum, mesoscutum except outer angles, sternum except cloud each side, pleura, venter except vagina exterior, coxae, femora except narrowly at base and apical one-third, red or orange red.

Head: Width 1.12 mm., vertex .59 mm., lateral width of eye .31 mm. Antennae: Segment i, length .49 mm.; ii, 1.54 mm., tapering slightly thicker toward apex; iii, 1.14 mm.; iv, .68 mm.

Male: Length 5 mm., width 1.7 mm.; very similar to the female in coloration, antennal segment ii slightly thicker and more nearly cylindrical.

Head: Width 1.08 mm., vertex .51 mm. Antennae: Segment i, length .44 mm.; ii, 1.71 mm., cylindrical, nearly as thick as segment i; iii, 1.26 mm.; iv, .81 mm.

Originally described from a single male specimen.

Allotype: Female, 4 July, 1909, Lakehurst, N. J. (C. E. Olsen); author's collection.

Maine, Massachusetts, New Jersey, New York, Nova Scotia.

***P. nigricollis* (Reuter).**

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 65, 1876.

Male: Length 6 mm., width 2.3 mm.; rather coarsely and thickly granulate; black, head except tylus, collar, xyphus and sides of pronotum, scutellum except basal angles, sternum except cloud each side of median line, pleura, venter except beneath on genital segment, red; legs black, coxae and basal one-third of hind femora pale to red.

Head: Width 1.14 mm., vertex .66 mm., lateral width of eye .28 mm. Antennae: Segment i, length .58 mm.; ii, 1.76 mm.; iii, 1.14 mm.; iv, .90 mm.

Female: Length 6.4 mm., width 2.6 mm.; very similar to the male in coloration. Head: Width 1.17 mm., vertex .66 mm., lateral width of eye .28 mm. Antennae: Segment i, length .61 mm.; ii, 1.74 mm.; iii, 1.22 mm.; iv, .94 mm.

Cornwall, 10 Aug., 1918 (B. H. W.); Goshen, 4 July, 1919 (M. P. Z.); Salem, 10 July, 1914 (H. W. F.).

***Platytylellus borealis* Knight, new species.**

Related to *nigricollis* but distinguished by the longer antennal segment i, and body surface more finely granulate; differs in color by the black scutellum, gula and xyphus, while the base of venter beneath is red.

Male: Length 6.6 mm., width 2.3 mm. Head: Width 1.24 mm., vertex .64 mm.; black, slenderly red at base of vertex. Rostrum, length 2 mm., reaching slightly beyond middle of coxae, black.

Antennae: Segment i, length .64 mm.; ii, 1.86 mm., nearly cylindrical; iii, 1.23 mm.; iv, .91 mm.; black.

Pronotum: Length 1.14 mm., width at base 1.9 mm., collar 1.07 mm.; collar, from above lower margin of eye, red, usually invaded with blackish above, a lateral stripe just beneath lateral margins of disk also red; finely granulate, short pubescent, pubescence dusky over the dark surface. Scutellum, sternum and pleura, black; ostiolar peritreme very small and inconspicuous, a group characteristic.

Hemelytra: Embolar margins only very slightly arcuate on

apical half; black, opaque, finely granulate, short pubescent. Membrane black, scarcely paler bordering apex of cuneus.

Legs: Black; tibiae with three rows of short spines, pubescence short.

Venter: Black, opaque, clothed with rather short pale to dusky pubescence; first four ventral segments orange or reddish beneath; genital claspers distinctive.

Female: Length 6.3 mm., width 2.7 mm.; slightly more robust than the male but very similar in coloration. Head: Width 1.18 mm., vertex .63 mm. Antennae: Segment i, length .67 mm.; ii, 1.86 mm.; iii, 1.33 mm.; iv, .97 mm.

Holotype: Male, 13 July, 1920, Cranberry Lake, N. Y. (C. J. Drake); author's collection. Allotype: 10 Aug., 1917, type locality (C. J. Drake). Paratypes: MAINE—Male, 1 Aug., 1910, Penobscot County (J. A. Cushman). MICHIGAN—Males and females (14), 6-31 July, 1919, Cheboygan County (E. P. Butler). MINNESOTA—Males (2) and females (3), 10 July, 1920, Morrison County (A. A. Nichol). Males (2), 25 Aug., 1920, Cross River, Cook County (H. H. Knight). NEW YORK—Male, 5 July, 1920, female, 10 Aug., 1917, Cranberry Lake (C. J. Drake). Male, 3 July, 1904, McLean (A. D. MacGillivray). NORTH DAKOTA—Male, 19 July, male, 2 Aug., male and female, 4 Aug., 1920, Turtle Mts. (T. H. Hubbel). VERMONT—Male, 12 July, 1891, Newport (A. P. Morse). ALBERTA—Male, 2 July, 1919, Edmonton (F. S. Carr). ONTARIO—Males (2), 27 July, Parry Sound (H. S. Parish); male, 8 Aug., 1915, Bondville (G. A. Moore).

***P. insignis* (Say).**

Compl. Writ., i, 342, 1859.

Male: Length 6.7 mm., width 2.6 mm.; black, opaque, very finely granulate; head red, tylus and more or less on juga and lora blackish; pronotum red, basal half of disk largely blackish but central area of disk red, broadly invading the black but not as a clearly defined vitta; scutellum red, lateral margins blackish; venter black, with not more than a red tinge at base.

Head: Width 1.19 mm., vertex .67 mm. Antennae: Segment i, length .74 mm.; ii, 2.2 mm.; iii, 1.54 mm.; iv, .97 mm.

Female: Length 7.6 mm., width 2.8 mm.; larger and more robust than the male but very similar in coloration. Head: Width 1.21 mm., vertex .38 mm. Antennae: Segment i, length .77 mm.; ii, 2.28 mm.; iii, 1.45 mm.; iv, 1.03 mm.

Cheshire, 8 July, 1904 (H. L. V.); Colebrook, 21 July, 1905 (H. L. V.); Guilford, 13 July, 1920 (B. H. W.).

***P. insignis* var. *fraterculus* Knight, new variety.**

Male: Length 5.1 mm., width 1.9 mm. Head: Width 1 mm., vertex .51 mm.; red, tylus blackish. Rostrum, length 1.69 mm., black, basal segment red. Antennae: Segment i, length .51 mm.; ii, 1.9 mm.; iii, 1.43 mm.; iv, .80 mm.

Pronotum: Length .90 mm., width at base 1.6 mm.; bright red, pronotal disk from just behind calli to basal margin black, with very slight indication of median vitta. Scutellum black; sternum and pleura red.

Hemelytra: Black, very slightly shining; thickly clothed with fine dusky pubescence, hairs recumbent on apical half.

Legs: Black; coxae red. Venter: uniformly red; genital claspers black.

Female: Length 6.6 mm., width 2 mm.; slightly larger and more robust than the male but similar in coloration. Head: Width 1.07 mm., vertex .51 mm. Antennae: Segment i, length .61 mm.; ii, 2.07 mm.; iii, 1.54 mm.; iv, .79 mm.

Holotype: Male, 2 Aug., Ann Arbor, Mich. (R. F. Hussey); author's collection. Allotype: 9 July, 1921, Minnehaha Creek, Hennepin County, Minn. (H. H. Knight). INDIANA—Male, 26 June, 1903, Crawford County; female, 7 July, 1903, Posey County (W. S. Blatchley). MINNESOTA—Male, 15 July, 1911, Chisago County. Male, 28 June, 1922, University Farm, St. Paul (H. H. Knight).

***P. circumcinctus* (Say).**

Compl. Writ., i, 343, 1859.

Male: Length 7.1 mm., width 2.7 mm.; head red, front and tylus blackish, juga and lora more or less black; pronotum red, calli blackish, a flaring black ray behind each callus and extending to basal margin of disk; scutellum and mesoscutum red, basal angles black; pleura red, sternum reddish but becoming blackish each side of median line; hemelytra black, embolium, outer margin of corium and cuneus, red; legs black, tinged with reddish near bases of femora; venter chiefly red, genital segment and more or less at the sides, becoming black.

Head: Width 1.28 mm., vertex .71 mm. Antennae: Segment i, length .77 mm.; ii, 2.34 mm.; iii, 1.54 mm.; iv, .95 mm.

Female: Length 7.4 mm., width 2.7 mm.; more robust than the male but very similar in coloration. Head: Width 1.2 mm., vertex .62 mm. Antennae: Segment i, length .76 mm.; ii, 2.03 mm.; iii, 1.34 mm.; iv, .91 mm.

New Jersey, New York, Massachusetts, Maine.

***Platytylellus rubellicollis* Knight, new species.**

Male: Length 7.5 mm., width 2.8 mm. Head: Width 1.27 mm., vertex .68 mm.; black, base of vertex and bucculae reddish. Rostrum, length 2.43 mm., black.

Antennae: Segment i, length .83 mm., thickness .17 mm.; ii, 2.54 mm., thickest (.12 mm.) near base and tapering to slightly more slender at apex, thickly clothed with short black hairs which in length do not equal thickness of segment; iii, 1.52 mm.; iv, .83 mm.; black.

Pronotum: Length 1.43 mm., width at base 2.37 mm., collar 1.14 mm.; calli impressed on basal margin, disk strongly convex; black, opaque, finely granulate, finely and closely pubescent; collar, lower half of propleura, narrow anterior margin of disk and extending between calli, fulvous to pink. Scutellum black; sternum and pleura velvety black.

Hemelytra: Embolar margins moderately arcuate on apical half; black, opaque, minutely granulate, finely and closely dusky pubescent.

Legs: Black; tibiae clothed with short heavy black hairs, length of hairs not equal to thickness of segment, hind pair with one row of short spine-like hairs on outer surface.

Venter: Velvety black; finely pubescent but with longer pubescent hairs beneath and bordering caudal margins of segments; genital segment without tubercle.

Female: Length 7.7 mm., width 2.9 mm.; very similar to the male in form and coloration.

Holotype: Male, 21 June, 1919, University Farm, St. Paul, Minn. (H. H. Knight); Minn. Univ. coll. *Allotype*: taken with the type. *Paratypes*: Males and females (38), taken with types. Both adults and nymphs were collected on *Scrophularia leporella*, but the conditions were such it was not possible to observe the bugs feeding on the plant.

***P. rubellicollis* var. *vittiscutis* Knight, new variety.**

Similar to the typical form but having a distinct reddish orange vitta on scutellum; calli becoming red, and the short median vitta extending to near middle of disk.

Holotype: Male, 21 June, 1919, University Farm, St. Paul, Minn. (H. H. Knight); Minn. Univ. coll. *Paratypes*: Males (5) and females (5), taken with the type. MAINE—Male, 31 July, 1920, Peaks Island (G. A. Moore). Female, 26 Sept., 1897, Mt. Kinco (F. Eddy).

***P. rubellicollis* var. *confluens* Knight, new variety.**

Similar to the typical form but the pink color more nearly orange; the broad orange vitta on scutellum connected with anterior margin of pronotal disk by a distinct orange vitta.

Holotype: Male, 24 July, 1920, Peaks Island, Me. (G. A. Moore); author's collection. *Paratypes*: MAINE—Female, 27 July, male, 28 July, female, 31 July, male and female, 4 Aug., 1920, type locality (G. A. Moore).

***P. insitivus* (Say).**

Compl. Writ., i, 340, 1859.

Male: Length 8.7 mm., width 3.6 mm.; black, pronotum and scutellum orange-yellow; surface very finely granulate, opaque, short pubescent; width of collar greater than width of head.

Head: Width 1.36 mm., vertex .81 mm. Width of collar 1.4 mm. Antennae: Segment i, length 1.07 mm.; ii, 3 mm. nearly cylindrical, length of hairs not equal to thickness of segment; iii, 1.98 mm.; iv, .94 mm.

Female: Length 8.7 mm., width 3.5 mm.; very similar to the male in form and coloration. Head: Width 1.41 mm., vertex .81 mm. Width of collar 1.44 mm. Antennae: Segment i, length 1.02 mm.; ii, 2.85 mm.; iii, 1.86 mm.; iv, .87 mm.

Lyme, 20 Aug., 1910 (B. H. W.).

***P. insitivus* var. *angusticollis* Knight, new variety.**

Color and form very similar to *insitivus* but smaller in size, width of head greater than width of collar.

Male: Length 6.9 mm., width 2.6 mm. Head: Width 1.24 mm., vertex 1.01 mm. Width of collar 1.17 mm. Antennae: Segment i, length .76 mm.; ii, 2.29 mm.; iii, 1.49 mm.; iv, .91 mm.

Female: Length 8 mm., width 2.9 mm.; similar to the male in form and color. Head: Width 1.26 mm., vertex .74 mm. Width of collar 1.18 mm. Antennae: Segment i, length .88 mm.; ii, 2.31 mm.; iii, 1.51 mm.; iv, .92 mm.

Holotype: Male, 31 July, 1920, Peaks Island, Me. (G. A. Moore); author's collection. Allotype: same data as the type. Paratypes: MAINE—Male, 29 July, female, 4 Aug., 1920 (G. A. Moore).

Platytylellus nigroscutellatus Knight, new species.

Suggestive of *insitivus* but with scutellum always black; male genital segment with a very prominent tubercle at base of left clasper and with a smaller one at base of right clasper.

Male: Length 9.2 mm., width 3.7 mm. Head: Width 1.71 mm., vertex .94 mm.; black; gula, genae, bucculae, and margins of lora and juga, orange-yellow. Rostrum, length 3.1 mm., extending to slightly beyond hind margins of middle coxae, black.

Antennae: Segment i, length 1.19 mm., clothed with erect almost pilose hairs, length of hairs not exceeding thickness of segment; ii, 3.43 mm., cylindrical, strongly pubescent, a few erect hairs near base equal to thickness of segment; iii, 1.66 mm.; iv, .94 mm.; black.

Pronotum: Length 1.89 mm., width at base 2.94 mm., collar 1.36 mm.; uniformly orange-yellow, finely granulate, clothed with short erect pale pubescence. Scutellum black; sternum blackish, pleura orange-yellow but becoming fuscous on central area of meta-episternum.

Hemelytra: Embolar margins very slightly but broadly arcuate; black, faintly shining, clothed with very fine short pubescence.

Legs: Black; tibiae clothed with erect prominent hairs, length of many hairs exceeding thickness of segment, spines not evident.

Venter: Black, with a velvety lustre; clothed with erect, fine dusky pubescence; genital segment with a large and prominent tubercle situated just above base of left clasper, and with a second but smaller tubercle near base of right clasper.

Female: Length 9.7 mm., width 3.5 mm.; very similar to the male in form and color. Head: Width 1.63 mm., vertex .91 mm. Width of collar 1.4 mm. Antennae: Segment i, length 1.14 mm.; ii, 2.87 mm.; iii, 1.76 mm.; iv, 1.31 mm.

Holotype: Male, 26 July, 1916, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: 3 Aug., 1914, Batavia, N. Y. (H. H. Knight). Paratypes: NEW YORK—Female, 1 Aug., 1918, Ithaca (H. Yuasa). Female, July, 1921, Ithaca (P. B. Lawson). PENNSYLVANIA—Male, 1 July, 1917, Conewago (J. G. Sanders).

***P. fraternus** Knight, new species.

Color pattern suggestive of *confraternus* but size larger, also the

length of antennal segment i is equal to width of vertex plus one-half dorsal width of an eye.

Male: Length 9.4 mm., width 3.5 mm. Head: Width 1.56 mm., vertex .86 mm.; red, tylus, front, and vertex, chiefly black; pubescent, finely granulate. Rostrum, length 2.85 mm., reaching to middle of hind coxae, black.

Antennae: Segment i, length 1.06 mm., clothed with moderately heavy and slightly reclining hairs which in length about equal thickness of segment; ii, 3.23 mm., thickest near base and tapering to more slender at apex, clothed with short stiff black hairs and fine pubescence, length of longest hairs not exceeding thickness of segment; iii, 1.71 mm.; iv, 1.28 mm.

Pronotum: Length 1.74 mm., width at base 2.92 mm., collar 1.31 mm.; surface very slightly shining, thickly clothed with short pale pubescence; basal margin of calli distinctly impressed; red, dorsal area of collar, calli except outer angles, and a broad band extending to basal margin of disk, black. Scutellum black; sternum blackish, median line red; pleura red, or becoming dusky.

Hemelytra: Embolar margins only slightly arcuate; black, opaque, surface somewhat scabriculous, clothed with short dusky pubescence, hairs somewhat decumbent on apical half.

Legs: Black; tibiae thickly clothed with prominent erect hairs, length of several exceeding thickness of segment, spines not evident.

Venter: Red, genital segment becoming black; clothed with prominent pale pubescence; genital segment with a large and prominent, erect tubercle just above base of left genital clasper, also another but smaller tubercle directed distad from near base of right clasper. In *confraternus* the right tubercle is scarcely raised from the segment wall.

Female: Length 9.1 mm., width 3.5 mm.; similar to the male in form and color. Head: Width 1.56 mm., vertex .87 mm. Width of collar 1.30 mm. Antennae: Segment i, length 1.02 mm.; ii, 2 mm., clothed with pubescence as in the male but beset with several exserted hairs which in length exceed thickness of segment; iii, 1.71 mm.; iv, 1.24 mm.

Holotype: Male, 2 July, 1917, White Sulphur Springs, W. Va. (Wm. T. Davis); author's collection. Allotype: 1 Aug., 1914, type locality (W. Robinson); author's collection. Paratypes: CONNECTICUT—Female, 25 July, 1920, Portland (B. H. Walden). DISTRICT OF COLUMBIA—Male, 22 June, Washington (N. Banks). MICHIGAN—Male, 25 June, female, 28 June, 1919, male, 3 July, 1920, Berrien County (R. F. Hussey). MINNESOTA—Female, 7 July, 1916, Lake City. NEW YORK—Male, 23 June, 1918, Fort Montgomery (F. M. Shott). PENNSYLVANIA—Male, 4 July, 1920, Enterline (Champlain). Female, 12 July, 1920, North Bloomfield (F. M. Trimble). NORTH CAROLINA—Male, 4 June, Male, 17 June, 1919, Southern Pines (A. H. Manee).

P. fraternus var. **rubromarginatus** Knight, new variety.

Not differing structurally from the typical form, but with

cuneus, embolium, and lateral margins of corium, red like the lateral margins of pronotal disk.

Holotype: Male, 1 July, 1919, Berrien County, Mich. (Hubbel and Hussey); author's collection. Paratypes: NEW HAMPSHIRE—Male, 12 Aug., 1922, Contoocook. NEW YORK—Male, 24 June, 1917, Fort Montgomery (F. M. Schott). PENNSYLVANIA—Male, 20 Aug., 1909, Greely, Pike County, alt. 2300 ft. (Einer Olsen).

P. fraternus var. **regalis** Knight, new variety.

Male: Length 8.7 mm., width 3.4 mm. Head: Width 1.57 mm., vertex .86 mm.; red, eyes black. Rostrum, length 2.9 mm., nearly attaining hind margins of posterior coxae, brownish black.

Antennae: Segment i, length .83 mm., clothed with erect pilose hairs, length of certain hairs equal to thickness of segment; ii 3.09 mm., pubescent, a few hairs near base equal to thickness of segment; iii, 1.69 mm.; iv, 1.23 mm.

Pronotum: Length 1.71 mm., width at base 2.6 mm., collar 1.28 mm.; uniformly bright red, pale pubescent, surface very finely granulate. Scutellum bright red like the pronotal disk; sternum and pleura bright red.

Hemelytra: Surface finely rugulose granulate, opaque; black, embolium, outer half of cuneus, and outer margin of corium, pale to bright red.

Legs: Brownish black, coxae red; tibiae thickly clothed with long pilose hairs, spines not evident.

Venter: Bright red, pale pubescent; genital segment with prominent tubercle at base of left clasper, and a smaller one at base of right clasper. Slight differences may be noted between this form and the typical *fraternus* but until more material is studied, and better structural characters are found, it is perhaps better to use a varietal name.

Female: Length 9.5 mm., width 3.6 mm.; more robust than the male but very similar in coloration.

Holotype. Male, 5 May, 1918, Gainesville, Fla. (C. J. Drake); author's collection. Allotype: 30 May, 1918, type locality (C. J. Drake). Paratypes: DISTRICT OF COLUMBIA.—Female, 4 May, 1884, Washington (O. Heidemann). FLORIDA—Female, 5 May, 1918, female, 7 July, 1918, Gainesville (C. J. Drake). NEW JERSEY—Female, 27 June, 1908, Malaga (Wm. T. Davis). VIRGINIA—Female, 21 June, 1914, Nelson County (W. Robinson). Female and nymph, 19 June, 1906, "Va." (D. H. Clemons). NORTH CAROLINA—Male, 19 May, Male, 24 May, 1919, Southern Pines (A. H. Manee).

P. fraternus var. **discifer** Knight, new variety.

Similar to *regalis* but the pronotal disk, except lateral margins and calli, black; between calli, and the dorsal area of collar, sometimes black, calli always red.

Holotype: Female, 6 May, 1912, Lakeland, Fla. (Wm. T. Davis); author's collection. Paratypes: FLORIDA—Females (2), 5 May, 1918, Gainesville (C. J. Drake). MARYLAND—Female, 26 June, 1882, Blandensburg (O. Heidemann). Female, 26 June, 1911, Cabin John Bridge (Wm. T. Davis).

Tribe CAPSINI.

Key to Genera.

1. Pronotum punctate, sometimes only very finely punctate but usually distinctly so; strongly shining, calli usually prominent 2
Pronotum impunctate, or with fine aciculate punctures only 9
2. Antennal segment ii linear or practically so 3
Antennal segment ii clavate; juga tumidly convex; vertex broad, transversely striolate each side near eyes; short oval, convex, black species (p. 571) **Capsus**
3. Antennal segment ii distinctly thinner at base than apex, sometimes sublinear but then distinctly thinner than segment i 4
Antennal segment ii linear although noticeably thickened, nearly as thick as segment i, entirely sublinear (male) or slightly attenuate toward base (female); both segments bearing heavy black pubescence 8
4. Pronotum between calli and anteriorly before collar, punctate ... 5
Pronotum between calli and anteriorly before collar, impunctate, subelevated 7
5. Lateral margins of pronotum carinate, form more ovate 6
Lateral margins of pronotum ecarinate, form more elongate and sub-parallel (p. 567) **Xenoborus**
6. Antennal segment i distinctly thicker than segment ii, both segments black; color, red and black (p. 561) **Tropidosteptes**
Antennal segment i slender, scarcely equaling thickness of segment ii at apex; if colored reddish, then antennal segments i and ii pale or yellowish (p. 561) **Neoborus**
7. Frons transversely striolate, dorsum practically glabrous; rostrum attaining base of seventh abdominal segment (p. 572) **Platylygus**
Frons nonstriolate, but if so, then the dorsum distinctly pubescent; rostrum rarely extending beyond tips of hind coxae .. (p. 572) **Lygus**
8. (3) Vertex convex, polished, carina nearly obsolete; form broad and rather convex, distinctly widened behind middle; large red species (p. 571) **Coccobaphes**
Vertex with base more flattened, distinctly carinate; body oblong, hemelytra subparallel (p. 569) **Lygidea**
9. (1) Antennal segment i thickened and clothed with numerous flattened hairs (p. 615) **Neurocolpus**
Antennal segment i devoid of flattened hairs 10
10. Pronotum with two subexcavated, opaque black spots situated behind the callosities; antennal segment i clothed with long black hairs and setae (p. 610) **Paracalocoris**
Pronotum without black spots, or if present, superficial and segment i of antennae without prominent long black hairs or setae; length of hairs on antennal segment i rarely exceeding thickness of the segment 11
11. Antennal segment ii strongly incrassated, fusiform (p. 615) **Garganus**
Antennal segment ii linear, or only very slightly thickened at tip 12
12. Hind femora long, extending much beyond tip of abdomen, flattened, broadest before middle and tapering to more slender at apex (p. 615) **Phytocoris**
Hind femora shorter, not or scarcely extending beyond tip of abdomen 13
13. Segment i of hind tarsi shorter than segment iii 14
Segment i of hind tarsi distinctly longer than segment iii (p. 614) **Stenotus**
14. Dorsal surface distinctly pubescent, opaque or nearly so 15
Dorsal surface glabrous, highly polished 18

15. Body above and below clothed with silky, sericeous or tomentose pubescence (p. 598) *Polymerus*
 Body clothed only with simple pubescence, never tomentose 16
16. Head broad, eyes practically in contact with pronotal angles, hind margin of eyes sulcate and forming an arcuate line with base of vertex (p. 597) *Dichrooscytus*
 Head not unusually broad, eyes convex behind and well removed from pronotal angles 17
17. Antennal segment iv at least equal to thickness of segment ii at base; width of collar (measured cephalo-caudally) scarcely greater than thickness of antennal segment iv (p. 610) *Adelphocoris*
 Antennal segment iv distinctly thinner than segment ii at base; width of collar (measured cephalo-caudally) distinctly greater than thickness of segment iv (p. 610) *Calocoris*
18. Rostrum short, scarcely surpassing the anterior coxae (p. 607) *Poecillocapsus*
 Rostrum longer, at least reaching to posterior margin of middle coxae (p. 607) *Horcias*

Tropidosteptes Uhler.

T. cardinalis Uhler.

Proc. Bost. Soc. Nat. Hist., xix, p. 404, 1878.

Length 5.5 mm., width 2.6 mm.; bright red; antennae, tylus, legs except apices of front and middle femora, hemelytra for a space either side of the commissure, and membrane, black.

Food plant: White ash (*Fraxinus americana*), and occasionally other ash trees; occurs most frequently on young ash trees.

Hamden, 28 May, 1911 (B. H. W.), 9 June, 1915 (Q. S. L.); Lyme, 16 June, 1918 (M. P. Z.); Meriden, 3 June, 1910 (W. E. B.); New Haven, 3 June, 1908 (B. H. W.); North Branford, 8 June, 1907 (B. H. W.); Yalesville, 27 June, 1907 (B. H. W.).

Neoborus Reuter.

Key to Species.

1. Dorsum practically glabrous 2
 Dorsum strongly pubescent or hairy 5
2. Rostrum not extending beyond posterior margin of sternum 3
 Rostrum attaining hind margins of middle coxae; line bordering outer margin of radius, widening apically, and curving mesad across apical area of corium, black *palmeri*
3. Antennal segment i pale, rarely somewhat dusky 4
 Antennae brownish black; scutellum brownish black, basal angles pale; hemelytra brownish black to piceous, basally on corium and embolium and extending farther along radius, pale or yellowish *glaber* n. sp.
4. Dorsum uniformly black, cuneus pale except apically; sometimes with a small pale spot at base of corium *geminus*
 Dorsum more or less pale, frequently marked with red, scutellum always with some pale or yellow *amoenus*
 (a) Chiefly pale, apical area of corium, and frequently marks on pronotum, reddish; membrane pale variety *amoenus* typical
 (b) Chiefly blackish, lateral and median vittae on pronotal disk, scutellum except basal angles and median line at base, and corium

- more or less, pale; membrane palevariety **signatus**
 (c) Chiefly black, cuneus and sometimes narrow base of corium
 pale; scutellum pale yellowish; membrane pale fumate, paler
 bordering apex of cuneusvariety **scutellaris**
5. Antennal segment i blackish 6
 Antennal segment i pale 7
 6. Scutellum testaceous, sometimes brownish on middle at base, never
 blackish with median line paler; frequently with clavus bordering
 scutellum, and apical area of corium, fusco-brownish, but cuneus
 always yellowish translucent**canadensis**
 Scutellum brownish black each side of median line, basal angles
 paler; hemelytra reddish brown translucent, cuneus colored simi-
 larly to the corium**rufusculus** n. sp.
 7. Dorsum more or less pale, scutellum always with yellowish 8
 Dorsum uniformly black, cuneus clear, legs pale**tricolor**
 8. Scutellum with median line black and extending from base to apex;
 (female) embolium and outer margin of corium blackish while
 inner apical angle of corium remains testaceous**vittiscutis** n. sp.
 Scutellum yellow, sometimes dark at middle of base but never with
 median line black; (female) inner apical angle of corium black
 while the embolium remains chiefly pale**pubescens**

N. geminus (Say).

Compl. Writ., i, 344, 1859.

Length 4.8-5.3 mm., width 2.2 mm.; deep black, shining; legs,
 antennal segment i and base of ii, cuneus except apex, pale; front
 of head usually marked with pale.

Food plants: White ash (*Fraxinus americana*). Usually occurs
 with *amoenus* during June.

Eastford, 12 June, 1919 (B. H. W.).

N. amoenus (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 48, 1909.

Length 4.3-5 mm., width 2 mm.; pale yellowish, marked with
 reddish and fuscous, and sometimes with black; pronotum with
 five to seven fuscous or reddish rays, clavus and apical area of
 corium marked with bright red, sometimes tinged with fuscous;
 apex of antennal segment ii, and sometimes iii and iv, fuscous.

Food plants: White ash (*Fraxinus americana*) and red ash
 (*F. pennsylvanica*), especially the latter. Nymphs occur on the
 trees from May to September; apparently two broods.

New Haven, 28 Sept., 1905; 4 Aug., 20 Sept., 1920 (B. H. W.).

N. amoenus var. **signatus** (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 49, 1909.

Pronotal disk black, median line, slender basal and lateral mar-
 gins, calli except for transverse mark, line leading from outer
 margin of callus to basal margin of disk, and a second short vitta
 just behind the callus, yellowish; scutellum yellowish, basal angles,
 small mark at middle of base, and the mesoscutum, blackish;
 clavus and corium blackish, or merely tinged with red, pale yellow-
 ish along claval vein and corium just inside of radius from base to
 about middle; cuneus pale translucent, dusky at apex; membrane

pale fuscous, veins and within larger areole, darker, paler bordering inner margin of cuneus.

New York.

N. amoenus var. **scutellaris** (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 49, 1909.

Dorsum piceous black, cuneus and small spot near base of corium, pale translucent; scutellum yellow, mesoscutum black; membrane pale, fuscous at base and on veins.

New York.

N. palmeri (Reuter).

Can. Ent., xl, 112, 1908.

Length 5.7 mm., width 2.4 mm.; pale yellowish with a brown shellac-like gloss; calli with a transverse mark, line along lateral margin of pronotal disk, and usually a second one parallel to it, line along outer margin of radius which widens apically and crosses the corium to inner angle of cuneus, fuscous to black; in pale specimens the black color showing only on the corium; sides of pleura frequently black; antennal segments iii and iv, and apex of ii, fuscous to black.

Food plant: *Fraxinus americana*, and probably other ash trees.

New Haven, 28 Sept., 1905 (B. H. W.); Washington, 24 June, 1914 (Mrs. G. Vaillant).

***Neoborus glaber** Knight, new species.

In coloration suggestive of *canadensis* but differs in the glabrous surface of the dorsum.

Male: Length 4.6 mm., width 1.9 mm. Head: Width 1.04 mm., vertex .43 mm.; yellowish, tylus, front each side of median line, joining above and sometimes transverse line between, brownish black. Rostrum, length 1.08 mm., reaching to middle of intermediate coxae, yellowish, apex black.

Antennae: Segment i, length .53 mm., brownish black; ii, 1.6 mm., brownish to dark fuscous, cylindrical, nearly equal to thickness of segment i, finely pale to dusky pubescent; iii, .51 mm., slender, fusco-brownish; iv, .38 mm., fusco-brownish.

Pronotum: Length .93 mm., width at base 1.57 mm.; glabrous, shining, coarsely punctate, lateral margins sharply defined but not prominently carinate; yellowish testaceous, propleura except line just below dorsal margin, calli, a large flaring ray behind each callus and extending to subbasal margin, brownish black, leaving median line more or less broadly and the slender basal margin yellowish. Scutellum brownish black, basal angles yellowish, coarsely punctate and transversely wrinkled; a minute short pubescent hair may be observed set in each coarse puncture; mesoscutum moderately exposed, dark brownish to blackish. Sternum and pleura brownish black, ostiolar peritreme pale.

Hemelytra: Embolar margin slightly sinuate, widest between middle and cuneal fracture; brownish black to piceous, shining,

coarsely and rather closely punctate, glabrous or with only a minute pubescent hair set in pit of coarse punctures; base of corium and embolium, and extending for a space along radius, yellowish testaceous; cuneus yellowish translucent, apical half and extending along inner margin to basal angle, fusco-blackish. Membrane and veins uniformly fuscous, a small pale spot bordering apex of cuneus.

Legs: Pale to yellowish, femora with two subapical brownish bands, obsolete on anterior pair; tibiae with brownish streak on knee; tarsi fuscous. Venter yellowish, two subdorsal lateral lines dark brownish, genital segment brownish; finely pale pubescent, more prominent on genital segment.

Female: Length 4.8 mm., width 2.2 mm.; more robust than the male and usually more broadly pale; basal half of corium and more than basal half of cuneus, yellowish; antennal segment ii, length 1.2 mm., slender at base, gradually thickened apically but not attaining thickness of segment i.

Holotype: Male, 24 June, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: 27 June, 1920, Ithaca, N. Y. (H. H. Knight); author's collection. Paratypes: CONNECTICUT—Female, 22 June, 1920, Orange (M. P. Zappé). MICHIGAN—Female, 28 June, 1920, Washtenaw County (R. F. Hussey). NEW HAMPSHIRE—Female, 18 June, 1912, Bretton Woods (C. W. Johnson). NEW YORK—Female, 7 June, 1914, Ithaca (H. H. Knight). Females (2), 3 June, 1918, Ithaca (H. H. Knight). NORTH DAKOTA—Female, 11 July, 1922, Fargo (R. L. Webster). OHIO—Male, 18 June, 1917, Tiffin (C. J. Drake). SOUTH DAKOTA—Male, 1 June, 1921, Brookings (H. C. Severin). ONTARIO—Males (2), 11 June, 1920, Ottawa (J. McDunnough).

***Neoborus rufusculus* Knight, new species.**

Male: Length 4.6 mm., width 1.86 mm. Head: Width 1.07 mm., vertex .36 mm.; vertex narrower and carina more prominently developed than in *canadensis*; yellowish, tylus, median line of front and joining arc above, and juga except sutural margins, blackish. Rostrum, length 1.28 mm., only attaining middle of intermediate coxae, yellowish, apex black.

Antennae: Segment i, length .48 mm., black; ii, 1.59 mm., cylindrical, constricted just before base, nearly as thick as segment i, pale pubescent, fusco-blackish; iii, .51 mm., fuscous; iv, .34 mm., fuscous.

Pronotum: Length .94 mm., width at base 1.69 mm.; coarsely and rather closely punctate, shining, clothed with erect pale yellowish pubescence; brownish black, collar, median line of disk but narrowed near basal margin, spot behind outer angle of each callus. and slender basal margin, yellowish testaceous; carinate lateral margins of disk only moderately distinct, slightly more sulcate than in *canadensis*. Scutellum rather coarsely punctate, clothed with erect yellowish pubescence; brownish black, median line and basal angles paler; mesoscutum brownish, with prominent pubescence. Sternum brownish black, median line yellowish, pleura

blackish, clothed with prominent pubescence; ostiolar peritreme pale.

Hemelytra: Embolar margins nearly straight but curved at each end; reddish brown translucent, darker on clavus bordering scutellum and commissure; rather coarsely and closely punctate, shining, clothed with prominent erect yellowish pubescence; cuneus reddish brown translucent, scarcely paler at base. Membrane and veins fusco-brownish, a small pale spot bordering apex of cuneus.

Legs: Yellowish, apical half of hind femora, somewhat on apex of middle pair, base of tibiae and somewhat on middle of hind pair, blackish; apices of tarsi fuscous. Venter blackish, ventral surface except on genital segment, yellowish, pale pubescent.

Female: Length 4.9 mm., width 2 mm.; larger and more robust than the male but very similar in coloration; pronotal disk more broadly yellowish, but not so the cuneus and scutellum; antennal segment ii, length 1.2 mm., more slender than in the male, gradually thickened from base toward apex but not attaining thickness of segment i, black, pale pubescent.

Food plant: *Fraxinus americana*.

Holotype: Male, 16 June, 1916, Ithaca, N. Y. (H. H. Knight); author's collection. Allotype: same data as type. Paratypes: NEW YORK—Males (3), 31 May, males and females (5), 7 June, male, 13 June, male, 14 June, 1914, male and female, 14 June, females (2), 16 June, 1916, females (4), 25 June, females (8), 27 June, 1920, Ithaca; females (2), 13 June, female, 25 June, 1915, Batavia; females (2), 22 June, 1916, Portageville; male and female, 16 June, 1915, Wyoming County (H. H. Knight). Males and females (26), 3 June, 1918, Ithaca (H. H. Knight).

N. canadensis (Van Duzee).

Bull. Buff. Soc. Nat. Sci., x, 486, 1912.

Male: Length 4.7 mm., width 2 mm.; yellowish testaceous, clavus, apical area of corium, two subapical bands on hind femora, and calli dark brownish black; pronotal disk each side of median line, obscure brownish to fuscous; base of scutellum at middle brownish, the brown color somewhat notched by paler on median line; dorsum coarsely and rather closely punctate, clothed with erect yellowish pubescence.

Head: Width 1.08 mm., vertex .41 mm. Antennae: Segment i, length .48 mm., black; ii, 1.46 mm., fusco-brownish, more nearly black at base, dusky pubescent, cylindrical, constricted at base, nearly attaining the thickness of segment i; iii, .49 mm., fuscous; iv, .34 mm., fuscous.

Female: Length 5.3 mm., width 2.4 mm.; more robust than the male, the dark color more brownish than blackish.

Food plant: *Fraxinus americana*.

Allotype: Male, 2 Aug., 1915, Batavia, N. Y. (H. H. Knight); author's collection. Originally described from two females collected at Ottawa, Ontario.

New York, Canada.

N. pubescens Knight.

Bull. Brook. Ent. Soc., xii, 81. 1917.

Length 4.6 mm., width 1.7 mm.; blackish and marked with pale; clothed with prominent erect pubescence; more coarsely punctured than in *amoenus*; pronotum with lateral margins distinctly carinate only on anterior half, black, top of collar, rather widely on median line of disk, one and sometimes two rays behind each callus, pale yellow; scutellum yellow, black at the middle of base and on the mesoscutum; sternum and pleura black, ostiolar peritreme pale; hemelytra pale, inner half of clavus, along claval suture, large apical spot on corium and slightly invading the embolium, black; membrane pale, female dark fuscous to black within the cells and margining the veins, dark fuscous in the male and extending to include the middle of membrane; venter black, sometimes paler in the female.

Food plant: *Fraxinus americana*, but found developing only on young plants in much shaded situations.

Massachusetts, New Hampshire, New York.

Neoborus vittiscutis Knight, new species.

Very suggestive of *pubescens* but with a different arrangement of the black color.

Male: Length 4 mm., width 1.86 mm. Head: Width 1.03 mm., vertex .37 mm.; blackish, bucculae, and margins of juga and lora, paler, front more brownish each side of median line. Rostrum, length 1.16 mm., reaching to middle of intermediate coxae, pale, apex black.

Antennae: Segment i, length .57 mm., pale; ii, 1.63 mm., cylindrical, nearly attaining thickness of segment i, slightly more slender toward base, pale pubescent, a few hairs equal to thickness of segment, pale, becoming reddish or dusky apically; iii, .66 mm., pale; iv, .38 mm., pale.

Pronotum: Length .94 mm., width at base 1.59 mm.; coarsely punctate, with an erect pale pubescent hair arising from each puncture; black, shining, spot on median line, an obsolete ray behind each callus, and carinate lateral margin, pale. Scutellum pale, narrow base, median line from base to apex but more slender apically, black; mesoscutum black, clothed with pale pubescent hairs. Sternum and pleura black, the latter clothed with erect pale pubescence; ostiolar peritreme pale.

Hemelytra: Embolar margins slightly sinuate; black, shining, coarsely punctate, an erect pale pubescent hair arising from each puncture; along claval veins and a spot near base of corium, slightly paler and somewhat translucent; cuneus pale translucent, narrowly fuscous at apex. Membrane uniformly fuscous, scarcely paler bordering apex of cuneus.

Legs: Uniformly pale, scarcely dusky on tips of tarsi. Venter black, moderately shining pale pubescent.

Female: Length 5 mm., width 2.3 mm.; more robust than the male and more broadly pale. Head: Width 1.06 mm., vertex .48 mm.; front, except median line, largely testaceous. Antennae: Pale; segment i, length .58 mm.; ii, 1.57 mm., slightly more slender than in the male. Pronotum: Disk yellowish testaceous, a blackish line bordering lateral carina, an obsolete fuscous line behind outer margin of callus. Scutellum colored similarly to the male, median line black from base to apex but more broadly so nearer base. Sternum and pleura black, ostiolar peritreme pale. Hemelytra: Pale testaceous, embolium and outer margin of corium, exterior to radial vein, black, tip of embolium pale; cuneus uniformly pale translucent. Membrane pale, areoles except small spot near basal angle of cuneus, veins and somewhat invading membrane bordering areoles, dark fuscous.

Holotype: Male, 13 June, 1908, Great Falls, Va. (O. Heidemann); Cornell Univ. collection. Allotype: taken with type. Paratype: Female, taken with types. MISSOURI—Female, 22 June, 1916, Charleston (E. H. Gibson).

N. tricolor (Van Duzee).

Bull. Buff. Soc. Nat. Sci., x, 487, 1912.

Female: Length 5.7 mm., width 2.8 mm.; black, antennae, rostrum except apex, legs, ostiolar peritreme, and cuneus, pale; antennal segment ii fuscous on apical one-fourth, segments iii and iv dusky; front of head reddish to brownish; dorsum rather coarsely punctured, with an erect, prominent, pale hair arising from each puncture.

New Jersey, Missouri.

Xenoborus Reuter.

Key to Species.

1. Membrane uniformly fuscous or black 3
 Membrane pale, or if fuscous, paler on middle 2
2. Dorsum uniformly pale greenish yellow, fuscous along commissure of hemelytra; length 6.4 mm. **commissuralis**
 Dorsum more broadly blackish; calli, spot each side of median line on pronotal disk, clavus except along claval vein, and spot on apical area of corium, fusco-blackish; membrane fuscous, but an oval spot on middle of apical half, and within the areoles, distinctly paler; length 5 mm. **plagifer**
3. Posterior tibiae uniformly pale, femora pale or only rarely dusky near apex; embolium and basal half of corium pale in both sexes **neglectus**
 Posterior tibiae fuscous, blackish near base, posterior femora blackish apically or with dark color forming two bands; embolium and basal half of corium only rarely pale in certain female specimens **pettiti**

X. commissuralis Reuter.

Can. Ent., xl, 112, 1908.

Length 6.4 mm., width 2.3 mm.; uniformly pale greenish, becoming yellowish after death; antennae, a narrow streak along commissure of hemelytra, tips of tarsi, and tip of rostrum, fusco-

blackish; membrane pale translucent, brachium and a streak beyond apex of larger areole, dusky.

Food plant: Black ash (*Fraxinus nigra*); occurs during August.

Canada, Minnesota, New York.

X. plagifer (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 51, 1909.

Length 5 mm., width 1.9 mm.; pale yellowish testaceous; antennae, calli, usually (male) spot each side of median line on pronotal disk, clavus except claval vein, and spot on apical area of corium, fusco-blackish; scutellum yellow; membrane fuscous, but an oval spot on middle of apical half, and within the areoles, distinctly paler; female more broadly pale, the infuscation on apical half of membrane forming a ray at each side behind areoles.

Food plant: Black ash (*Fraxinus nigra*); occurs during August.

Canada, Minnesota, New York.

X. neglectus Knight.

Bull. Brook. Ent. Soc., xii, 82, 1917.

Resembles certain pale forms of *pettiti* but with left genital clasper much longer and more spatulate toward apex.

Male: Length 5.4 mm., width 2.1 mm.; black with pale; antennae fusco-blackish, paler on base of segment i; head with lower half of face fuscous, front pale and flecked with reddish; carina and a small median dash at middle of vertex, blackish. Pronotum ecarinate, punctuation and pubescence nearly as in *plagifer*; collar and large median spot or ray on disk, white or pale yellow; pale ray extending from outer angle of callus along lateral margin of disk to include basal angle; scutellum pale yellowish, mesoscutum blackish. Hemelytra blackish, embolium, basal angle of corium, and cuneus, pale translucent; membrane uniformly fuscous, in the female slightly paler on middle, but in that case a black ray behind each callus while the lateral margin and basal angle of disk remain yellowish. Legs pale yellowish, hind femora sometimes dusky near apices but never distinctly banded.

Occurs during June and probably breeds on *Fraxinus nigra*.

Michigan, New York.

X. pettiti (Reuter).

Acta Soc. Sci. Fenn., xxxvi, No. 2, 50, 1909.

Length 5.7 mm., width 2.1 mm.; black; scutellum yellow; sometimes with embolium, basal half of corium, and cuneus except apex, pale; front of head and pronotal disk sometimes reddish, lateral margins and basal angles of disk never pale as the median line, except in teneral specimens killed before any black color develops on pronotum; legs pale, posterior femora blackish apically, or with dark color forming two subapical bands.

Food plant: *Fraxinus americana*; occurs during June.

Massachusetts, New York.

Lygidea Reuter.*Key to Species.*

1. Rostrum reaching to near apices of hind coxae 3
 Rostrum scarcely attaining posterior margins of intermediate coxae 2
2. Antennal segment i, in length, not or scarcely exceeding width of vertex; hemelytra with pubescence dense and closely appressed; cuneus chiefly red, female frequently with dorsum red *rosacea*
 Antennal segment i, in length, equal to width of vertex plus one-half dorsal width of an eye; hemelytra with pubescence chiefly suberect, set moderately close; cuneus chiefly pale, red only along inner margin and apex *viburni* n. sp.
3. Color orange-red, basal margin of pronotum, hemelytra except outer margins more or less, fuscous to blackish *mendax*
 Color chiefly fuscous to blackish, ground color pale to greenish, never reddish *obscura*

L. viburni Knight, new species.

Male: Length 7 mm., width 2.3 mm. Head: Width 1.2 mm., vertex .52 mm. Rostrum, length 3 mm., scarcely attaining posterior margins of intermediate coxae. Antennae: Segment i, length .74 mm., brownish black, more brownish above; ii, 2.3 mm., brownish black, black at base, cylindrical, scarcely equal to thickness of segment i, clothed with suberect hairs which in length about equal thickness of segment; iii, 1.14 mm., black; iv, .51 mm., black.

Pronotum: Length 1.12 mm., width at base 2 mm.; disk more coarsely punctate than in *mendax*, clothed with nearly erect yellowish pubescence; pale yellowish to brownish, calli, spot across top of coxal cleft, basal margin of disk each side of median line, and sometimes a ray each side of median line extending from calli to join basal margin of disk, blackish. Scutellum yellowish brown, more nearly black each side of pale median line; mesoscutum broadly exposed, brownish.

Hemelytra: Embolar margins nearly parallel, curving inward apically to meet base of cuneus; yellowish brown and in places darkened with fuscous; clothed with moderately close, suberect golden yellow pubescence. Cuneus yellowish translucent, reddish along inner margin and apex but not attaining basal angle. Membrane fusco-brownish, veins and a spot near apex of cuneus somewhat paler.

Legs: Yellowish to brown, apical half of femora reddish and brown; coxae pale yellowish, tarsi becoming infuscated. Venter pale yellowish beneath, sides with dorsal half and the genital segment brownish black; clothed with prominent pale yellowish pubescence, longer on genital segment.

Female: Length 7 mm., width 2.6 mm.; very similar to the male although more uniformly brownish in color. Head: Width 1.28 mm., vertex .64 mm. Antennae: Segment i, length .80 mm.; ii, 2.3 mm.; iii, 1.31 mm.; iv, .77 mm.

Holotype: Male, 24 June, 1915, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (90), taken with the types on *Viburnum Lentago*. NEW YORK—Males (2), females (2), 12 July, 1914; females (3), 27 July, 1915, Batavia; male and female, 6 July, 1915, Wyoming County (H. H. Knight).

Food plant: Nannyberry (*Viburnum Lentago*); breeds especially on young growth.

Massachusetts, New York.

L. rosacea Reuter.

Lygidea rubecula var. *rosacea* Reuter, Acta Soc. Sci. Fenn., xxxvi, No. 2, 46, 1909.

Male: Length 6.7 mm., width 2 mm. Head: Width 1.26 mm., vertex .63 mm. Rostrum, length 1.85 mm., reaching to middle of intermediate coxae. Antennae: Segment i, length .60 mm.; ii, 2.1 mm.; iii, .88 mm.; iv, .57 mm.

Hemelytra densely clothed with closely appressed, golden yellow pubescence; clavus and apical half of corium fuscous to black, basal half of corium and embolium yellowish translucent. Cuneus red, yellowish at base but extending to middle along outer margin.

Female: Length 6.5 mm., width 2.6 mm. Head: Width 1.34 mm., vertex .68 mm. Rostrum, length 1.97 mm., reaching to middle of intermediate coxae. Antennae: Segment i, length .60 mm.; ii, 1.9 mm.; iii, .80 mm.; iv, .60 mm. Dorsum chiefly red although in dark forms the clavus and apical half of corium becoming infuscated.

In Minnesota the writer has found this species to breed abundantly on the sand bar willow (*Salix longifolia*), but only on this species of willow. Typical specimens are also at hand from Illinois, the type locality. *Lygidea rubecula* (Uhler), described from Colorado, was collected on willow at Steamboat Springs; this species may be distinguished from *rosacea* by the longer rostrum.

Illinois, Minnesota.

L. obscura Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 46, 1909.

Male: Length 6 mm., width 2.2 mm.; smaller and darker colored than *rubecula*; dark fuscous to black, genae, apices of juga, median line on frons, median line and slender basal margin of pronotum, lateral margins of scutellum and median line except basally, sternum and lower half of venter except on genital segment, coxae, basal half of femora, tibiae except base and apex, pale to yellowish; cuneus pale translucent, inner half reddish, apex dark red to blackish.

Female: Length 6 mm., width 2.4 mm.; very similar to the male but with less blackish; yellowish to brownish and darkened with fuscous; head yellowish, base of juga, broad mark on frons each side of median line, black; pronotum brownish, broadly at lateral margin and a ray behind callus at each side of pale median line,

black; hemelytra rather uniformly fusco-brownish; hind femora banded with blackish before apices, anterior face more or less blackish on apical half.

This species was described by Reuter as a variety of *rubecula* Uhler but proves on examination to be a distinct species. The female type is now contained in the collection of E. P. VanDuzee.

Food plant: *Salix nigra*.

Allotype: Male, 27 June, 1916, Honeoye Falls, N. Y. (H. H. Knight); author's collection.

New York.

L. mendax Reuter. Light apple red bug. (Pl. xvi, 16.)

Acta Soc. Sci Fenn., xxxvi, No. 2, 47, 1909.

Cornell Univ. Agr. Expt. Sta., Bull. 291, 1911.

Length 6.4 mm., width 2.2 mm.; bright orange-red; tylus, apically on rostrum, antennae, each side of median line on scutellum, clavus, inner half of corium and cuneus, and membrane, dark fuscous to black; legs greenish to fuscous.

Food plants: *Crataegus*, *Pyrus coronaria*, cultivated apple, and to some extent on cultivated quince. This insect is now regarded as a serious pest on apples in New York and Pennsylvania.

Milford, 26 June, 1916 (W. E. B.); New Haven, 15, 23, 25 June, 1914 (B. H. W.) (M. P. Z.); Wallingford, July (D. J. C.); Washington, 24 June, 1914 (Mrs. G. H. Vaillant).

Coccobaphes Uhler.

C. sanguinarius Uhler. (Pl. xvi, 17.)

Proc. Bost. Soc. Nat. Hist., xix, 401, 1878.

Length 7.5 mm., width 3.4 mm.; bright red; dusky for a space either side of the hemelytral commissure; membrane, first two segments of antennae, tibiae, and apices of tarsi, black; segment iii of antennae pale, segment iv fuscous.

Food plants: Sugar maple (*Acer saccharum*), and occasionally red maple (*A. rubrum*); breeds most abundantly on second growth or young trees.

Hamden, 18 June, 1919 (M. P. Z.); Hartford, 26 June (W. M.); Litchfield, 20 June, 1908 (L. B. W.); New Haven, 12 June, 1902 (W. E. B.); 23 June, 1905 (B. H. W.); South Meriden, 27 June, 1914 (H. L. J.).

Capsus Fabricius.

C. ater (Linnaeus).

Cimex ater Linnaeus, Syst. Nat., Edn. 10, 447, 1758.

Saunders, Het. Brit. Isds., 262, pl. 24, fig. 5, 1892.

Reuter, Hem. Gymn. Eur., v, 14, 357, 1896.

Length male 5.7 mm., width 2.6 mm.; female, length 5.8 mm., width 3.1 mm.; uniformly black, moderately shining; pronotum shallowly, but rather coarsely punctate; clothed with pale to yel-

lowish pubescence; easily distinguished by the clavate antennal segment ii.

Food plants: *Poa compressa*, *Agropyron repens*, and probably other grasses.

Berlin, 30 June, 1905 (W. E. B.); Branford, 27 June, 1904 (H. L. V.); 13 June, 1920 (B. H. W.); Guilford, 14 June, 1920 (B. H. W.); Mount Carmel (Hamden), 22 June, 1908 (W. E. B.); Lyme, 16 June, 1920 (B. H. W.); Middlebury, 16 June, 1911 (B. H. W.); New Haven, 30 May, 1 June, 1911, 10 June, 14 June, 16 June, 1920 (B. H. W.), 24 June, 1905 (W. E. B.); North Branford, 15 June, 1920 (M. P. Z.); Southington, 5 July, 1905 (B. H. W.); Suffield, 21 June, 1920 (M. P. Z.).

C. ater var. **tyrannus** (Fabricius).

Lygaeus tyrannus Fabricius, Ent. Syst., iv, 177, 1794.

Reuter, Hem. Gymn. Eur., v, 15, 1896.

Similar to the typical form but with legs fulvous or reddish; femora with two dark subapical annuli, sometimes obscured on basal half; apices of tibiae fuscous.

C. ater var. **semiflavus** (Linnaeus).

Cimex semiflavus Linnaeus, Syst. Nat., Edn. 12, i, 725, 1867.

Reuter, Hem. Gymn. Eur., v, 15, 1896.

Similar to variety *tyrannus* but with the fulvous color extending to cover pronotum and head.

Canaan, 14 June, 1916 (M. P. Z.); Cornwall, 20 June, 1920 (K. F. C.); Greenwich, 23 June, 1916 (M. P. Z.); Hamden, 2 June, 1911 (A. B. C.); New Haven, 30 May, 1911 (B. H. W.).

Platylagus Van Duzee.

P. luridus (Reuter).

Lygidea rubecula var. *lurida* Reuter, Acta Soc. Sci. Fenn., xxxvi, No. 2, 46, 1909.

Bull. Brook. Ent. Soc., xiii, 16, 1918.

Male: Length 6.5 mm., width 2.4 mm.; minutely pubescent, the dorsum practically glabrous; pale yellowish brown, hemelytra strongly translucent, collar and tip of scutellum pale to white; apex and inner half of cuneus, brachium, disk of scutellum, apically on femora, and more or less on venter, becoming reddish; antennal segments iii and iv infuscated, apex of rostrum piceous, membrane fumate or pale brownish.

Female: Length 7 mm., width 2.7 mm.; more robust than the male but very similar in structure and coloration.

Food plant: *Pinus strobus*. The nymphs are yellowish with a tinge of brownish, thus very closely matching the color of the bud scales.

New Hampshire, New York.

Lygus Hahn.

Key to Species.

- i. Rostrum not or scarcely exceeding apices of hind coxae 2
Rostrum attaining middle of venter; pronotum sparsely and shal-

- lowly punctate; collar and tip of scutellum white; female usually reddish and with fuliginous on pronotum, male very slender and nearly black (p. 574) *approximatus*
2. Length of antennal segment ii exceeding width of head 3
Length of antennal segment ii less than or scarcely equaling width of head; basal carina scarcely raised from base of vertex; ovate, robust, yellowish brown to dark reddish brown and darkened with fuscous (p. 575) *rubicundus*
3. Length of antennal segment ii exceeding width of pronotum at base, or if not, then the head not particularly broad and length of insect exceeding 4.5 mm. 4
Length of antennal segment ii scarcely equaling width of pronotum at base; head unusually broad for size of insect, equal to more than one-half the width of pronotum at base; eyes large; small, form ovate, length 4-4.5 mm. (p. 579) *fasciatus*
(a) Scutellum dark red or ferruginous, median line, or at least the apex, paler; anal area of membrane infuscated variety *fasciatus* typical
(b) Scutellum bright green, with not more than two or three dots of red at lateral margins; anal area of membrane not distinctly infuscated variety *viridiusculus*
4. Vertex with basal carina entire; variously colored 5
Vertex with basal carina obsolete in the middle, apparent only at corners of eyes and from thence an impressed line extends to near center of vertex; green or greenish yellow, fading to dull yellowish; Y-shaped fuscous mark formed by anal area of membrane, usually with a longitudinal cloud distad of the areoles ... (p. 579) *pabulinus*
5. Pronotum coarsely, or at least distinctly punctate; body integuments heavily chitinized; adults hibernates; right genital clasper of male with claw at tip, curving ventrad or caudad, in length less than greatest width of clasper; left clasper without prong at middle (at posterior extremity of lateral aspect) 6
Pronotum very finely punctate; body integuments more thinly chitinized, more fragile forms; adults do not hibernate; right genital clasper of male with an apical hook or prong projecting mesad, its length as great as or greater than thickest part of the clasper; left clasper with a prong at middle (p. 580) subgenus *NEOLYGUS*
6. Rostrum reaching to near posterior margins of hind coxae 7
Rostrum just attaining posterior margins of middle coxae; scutellum bright yellow or green (p. 575) *campestris*
7. Color yellowish brown to blackish, or reddish; tibiae annulated with darker near base 8
Color chiefly green; tibiae pale greenish, without annuli at base; eyes large (p. 578) *apicalis*
8. Hemelytra blackish and irregularly mottled with greenish yellow; head and anterior part of pronotum yellowish green, usually with two black rays behind each callus (p. 578) *plagiatus*
Hemelytra sometimes dark but not mottled with paler; head and pronotum otherwise colored 9
9. Smaller forms, length 4.8-6 mm.; distinctly pubescent (p. 575) *pratensis*
(a) Yellowish brown with more or less blackish markings, or reddish brown with fuscous; pronotum with yellowish and blackish rays; hemelytra reddish brown or blackish, streaked with yellowish or gray variety *oblineatus*
(b) Chiefly blackish but streaked with yellowish; head blackish but with four longitudinal yellowish marks on front variety *strigulatus*

- (c) Color chiefly bright red, pronotum with a black spot behind each callus; scutellum pale, marked with red at middle of base variety **rubidus**
 (d) Hemelytra pale, apical area of corium bright red; scutellum yellow, marked with black only at middle of base variety **rubrosignatus** n. var.
 Larger forms, length 6.5-7.3 mm.; nearly glabrous, strongly shining (p. 577) **vanduzeei**
 (a) Yellowish brown to rich brown and fuscous ... typical **vanduzeei**
 (b) Chiefly bright ruby red variety **rubroclarus**



FIG. 97. *Lygus approximatus* Stål,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, external lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

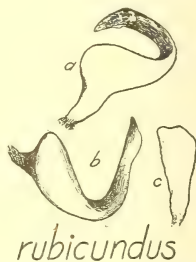


FIG. 98. *Lygus rubicundus* Falen,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. approximatus (Stål).

Deraeocoris approximatus Stål, Stet. Ent. Zeit., xix, 185, 1858.
 Cornell Univ. Agr. Expt. Sta., Bull. 391, 597, 1917.

Male: Length 5 mm., width 1.8 mm.; head strongly produced downward, carina prominent, nearly straight, vertex with an impressed triangle just in front; rostrum reaching to middle of venter; slender, nearly black, collar and tip of scutellum white; membrane infuscated, veins reddish; cuneus and membrane only slightly deflected, thus giving the appearance of an *Orthotylus*; genital claspers distinctive of the species (fig. 97).

Female: Length 4.9 mm., width 1.8 mm.; dark brownish with fuliginous; tylus black, frequently darkened over the whole front; pronotum darkened with fuliginous on the base and along lateral margins of disk, in some forms much darker, rarely the whole pronotum may be nearly black as in the male; collar and tip of scutellum white, very narrow basal margin of disk pale; sternum and pleura chiefly fuliginous; venter, hind femora, and often the intermediate femora, strongly reddish.

Occurs on hemlock (*Tsuga canadensis* L.); frequently attracted to the flowers of *Solidago macrophylla*.

Maine, New Hampshire, New York.

L. rubicundus (Fallen).

Phytocoris rubicundus Fallen, Hemip. Suec., 92, 1829.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 589, 1917.

Male: Length 4.5 mm., width 2.14 mm.; ovate, robust, dark reddish brown to fuscous; antennal segment ii shorter than width of head; genital claspers very distinctive of the species (fig. 98).

Female: Very similar to the male in structure but usually not so darkly colored.

Breeds on *Salix amygdaloides*, also occurs to some extent on other willows.

Portland, 25 July, 8 Aug., 1913 (B. H. W.).

L. campestris (Linnaeus).

Cimex campestris Linnaeus, Syst. Nat., Edn. 10, 448, 1758.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 592, 1917.

Male: Length 4.1 mm., width 1.77 mm.; ovate, rather small, greenish brown or brownish yellow with fuscous, scutellum bright yellow or green; genital claspers distinctive of the species.

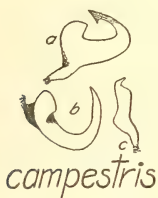


FIG. 99. *Lygus campestris* Linnaeus,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 100. *Lygus pratensis* Linnaeus,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Slightly more robust than the male, antennal segment ii more slender; very similar to the male in coloration.

Breeds on *Conium maculatum*, also on other plants of the family Umbelliferae.

Branford, 28 July, 1905 (H. W. W.); Colebrook, 21 July, 1905 (H. L. V.); New Haven, 2 June, 1908 (B. H. W.); Orange, 3 Apr., 1905 (W. E. B.).

L. pratensis Linnaeus var. **oblineatus** (Say). Tarnished plant bug. (Pl. xvi, 15.)

Capsus oblineatus Say, Heter. N. Harm., 21, 1832; Compl. Writ., i, 340, 1859.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 564, 1917.

Male and female: Length 4.9-5.5 mm., width 2.5 mm.; ovate, shining, yellowish brown with more or less blackish marking, or

reddish brown and fuscous; pronotum with yellowish and blackish rays; scutellum margined with blackish, leaving a Y- or heart-shaped area yellowish; hemelytra reddish brown or blackish, streaked with yellowish or gray.

This is the commonest species of the family Miridae in the eastern United States and is found everywhere frequenting many kinds of plants. It is a pest on nursery stock, ornamental plants, and cultivated crops.

Common throughout the state.

L. pratensis var. **strigulatus** (Walker).

Walker, Cat. Heteroptera, vi, 94, 1873.

A very dark form of *pratensis*, having all pale markings much reduced; head blackish but with four longitudinal yellowish marks on front.

New Haven, 9 Nov., 1919 (H. C. Fortner).

L. pratensis var. **rubrosignatus** Knight, new variety.

Apparently not differing appreciably from the typical *pratensis*, but somewhat smaller and having a different color aspect.

Male: Length 5.4 mm., width 2.47 mm. Head: Pale to yellowish, more or less tinged with reddish, tips of juga and sometimes spot above base of antenna, blackish. Antennae nearly black, segment ii somewhat brownish at middle.

Pronotum: Pale to yellowish, calli except inner half, extending rather broadly to anterior angles of disk, and two short rays behind each callus, black; basal angles infuscated, a black ray just above coxal cleft. Scutellum yellow, black at middle of base, the dark color sometimes extending to middle of disk; mesoscutum black but narrowly exposed.

Hemelytra: Pale translucent, tip of clavus and more or less broadly on apical area of corium, bright red; clavus becoming brownish black bordering scutellum; cuneus pale translucent, apex scarcely infuscated, inner margin slenderly red. Membrane pale fuscous, slightly paler on middle and bordering tip of cuneus; veins red or becoming reddish.

Legs: Pale to yellowish, femora with two blackish, subapical bands.

Venter: Yellowish, genital segment becoming infuscated on lower side at base.

Female: Length 4.9 mm., width 2.48 mm.; very similar to the male but more broadly pale; antennal segment ii black but showing brown at middle; each callus with spot on outer basal angle and another just behind middle on disk, black; tip of clavus and a small spot at apex of corium bright red.

Holotype: Male, 15 July-6 Aug., 1917, Woods Hole, Massachusetts (Chris E. Olsen); author's collection. Allotype: same data as type. Paratypes: Male, topotypic. Male, 9 Aug., 1911, Nantucket, Mass. (C. W. Johnson).

L. pratensis var. **rubidus** Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 565, 1917.

Male: Length 5.5 mm., width 2.5 mm.; bright ruby red; pronotum with a small black spot behind each callus; antennal segments red, with apex of segment ii, and all of segments iii and iv, blackish; scutellum pale, marked with red at middle of base; cuneus margined with red but pale translucent in the middle; ostiolar orifice and a longitudinal stripe on sides of venter paler; tibiae pale reddish, spines black; sternum beneath, and tips of tarsi, blackish.

Maine.

L. vanduzeei Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 565, 1917.

Male: Length 7.1 mm., width 3.3 mm.; larger than *pratensis*, nearly glabrous, strongly shining, yellowish brown to rich brown with fuscous; genital claspers distinctive of the species (fig. 101).

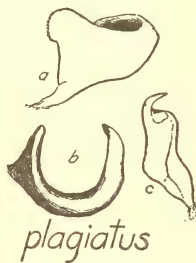


FIG. 101. *Lygus vanduzeei* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

FIG. 102. *Lygus plagiatu* Uhler,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Very similar to the male in size and coloration.

Colebrook, 19 June (P. G.); Cornwall, 4 June (K. F. C.); Danbury, 29 Aug. (B. H. W.); New Haven, 27 July (B. H. W.); Portland, 24 July, 1921 (B. H. W.).

L. vanduzeei var. **rubroclarus** Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 567, 1917.

Length 6.6 mm., width 2.9 mm.; structurally very similar to *vanduzeei* but differing greatly in general appearance; slightly smaller than the typical *vanduzeei* but larger than *pratensis*; bright ruby red, shining; pronotum and antennae marked with blackish as in *vanduzeei*.

Norfolk, 5 June (M. P. Zappe).

L. plagiatus Uhler.

Lygus plagiatus Uhler, Hemip. Colo., 35, 1895.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 576, 1917.

Male: Length 5.3 mm., width 2.8 mm.; more robust than *pratensis*, black with greenish yellow, mottled; head and anterior part of pronotum yellowish or olive green, hemelytra irregularly mottled with black and paler spots; differs from *pratensis* in the antennal segments and in the form of the right genital clasper.

Female: Slightly more robust than the male and usually paler in color; second antennal segment shorter; pronotum more yellowish, black rays behind the calli frequently not reaching the black basal margin; venter greenish yellow, blackish on the vagina exterior, dark specimens with the black more extended.

Breeds on great ragweed (*Ambrosia trifida*).

Massachusetts, Rhode Island, Long Island, N. Y.

L. apicalis Fieber.

Lygus apicalis Fieber, Eur. Hemip., 275, 1861.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 601, 1917.

Male: Length 4.5-5 mm., width 2 mm.; oblong; width of head 1.12 mm., vertex .29 mm.; greenish, dark green, or yellowish green, the membrane, and in some cases the corium, marked with fuscous; head broad, the eyes unusually large in the male; genital claspers very distinctive of the species (fig. 103).



FIG. 103. *Lygus apicalis* Fieber, —male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 104. *Lygus pabulinus* Linnaeus, —male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, internal lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Length 4.6 mm., width 2.05 mm.; width of head 1.05 mm., vertex .37 mm.; uniformly green or greenish yellow; eyes dark brown; tips of tarsi and apex of rostrum blackish.

Breeds on *Erigeron canadensis*.

Massachusetts, Maine.

L. pabulinus (Linnaeus).*Cimex pabulinus* Linnaeus, Fauna Suec., Edn. 2, 253, 1761.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 595, 1917.

Male: Length 5.5 mm., width 2 mm.; elongate, pale green or greenish yellow, frequently fading to dull yellowish; carina of vertex obsolete in the middle; a fuscous Y-shaped mark formed at the extreme anal area of membrane, and usually a spot within the apices of areoles and a distinct longitudinal cloud extending beyond to tip of membrane.

Female: Length 6.1 mm., width 2.22 mm.; slightly larger and more robust than the male but not differing in coloration.

Breeds on *Impatiens biflora*.

Bridgeport, 20 Sept. (B. H. W.); Cheshire, 8 July, 1904 (H. L. V.); Darien, 10 June, 1912 (C. W. J.); Middletown, 17 June, 1909 (C. W. J.); New Haven, 10 June, 1910, 22 and 25 July, 3 Oct. (B. H. W.); Stratford, 28 Aug., 1905 (W. E. B.).

L. fasciatus Reuter.

Ofv. Kongl. Sv. Vet.-Akad., Forh., xxxvi, No. 2, 72, 1876.

Male: Length 4 mm., width 1.7 mm.; small ovate, greenish and marked with reddish and brown; eyes large, width of head 1.03 mm., vertex .27 mm.; width of pronotum at base 1.5 mm., length of antennal segment ii 1.33 mm.; scutellum except median line or apex dark reddish, red sometimes composed of spots; inner half of clavus and inner apical angles of corium, brownish black; apical half of hind femora broadly red, the apex and a ring just



FIG. 105. *Lygus fasciatus* Reuter,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

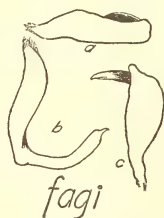


FIG. 106. *Lygus fagi* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

before pale, tibiae annulated at base with dark reddish, or at least reddish on inside at base; anal area of membrane distinctly infuscated; genital claspers distinctive (fig. 105).

Female: More robust than the male but very similar in coloration.

Breeds on *Cephalanthus occidentalis*, also collected on *Baccharis halimifolia*, *Myrica cerifera*, and attracted to flowers of *Hemerocallis fulva*.

Branford, 27 June, 1904 (H. L. V.); East River, 2 Aug., 7 Sept., 1910 (C. R. Ely).

L. fasciatus var. viridiusculus Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 600, 1917.

Female: Length 4.6 mm., width 2.05 mm.; structurally differing very slightly, if at all, from the typical form; bright green, slightly larger than and lacking the brownish and fuscous coloring of *fasciatus*; clavus only slightly tinged with fuscous at tip of scutellum, a touch of fuscous at inner apical angles of corium; anal area of membrane not distinctly infuscated; hind femora with two red marks on upper sides near apices, tibiae reddish on inside at base.

Massachusetts.

Subgenus NEOLYGUS Knight.

Key to Species.

1. Pronotal disk blackish or marked with dark rays 21
Pronotal disk greenish, or yellowish to brownish, but without distinct dark rays 2
2. Color chiefly greenish, old specimens frequently fading to yellowish; sometimes darkened on clavus and at tip of corium but ground color green 3
Color distinctly yellowish or brownish, more brownish than green 10
3. Tibial spines with fuscous spots at base 4
Tibial spines without fuscous spots at base 5
4. Corium with fuscous spot on inner apical angle; clavus greenish yellow, more brownish near scutellum and suture .. (p. 584) **confusus**
Corium never infuscated but with dilute bronze on inner half; clavus and basal half of pronotum distinctly bronzed ... (p. 584) **alni**
5. Dorsum uniformly greenish, a small fuscous mark formed at extreme inner apical angles of corium and transversely across anal area of membrane; length 5.2-5.7 mm. (p. 590) **neglectus**
Dorsum with brownish, apical area of corium and usually the clavus distinctly brownish, sometimes dark brownish or even fuscous, but more broadly so than the above 6
6. Membrane with apical half infuscated along median line, forming a distinct longitudinal ray which may be widened apically; corium with a triangular dark brownish spot just before apex, clavus usually brownish; length 5.6-6 mm. (p. 593) **belfragii**
Membrane never forming median longitudinal fuscous ray; smaller forms 7
7. Antennal segment ii not distinctly infuscated 8
Antennal segment ii infuscated on apical one-fifth (p. 595) **canadensis**
8. Scutellum pale, clavus and apex of corium usually darkened 9
Scutellum darkened with fuscous, also the clavus more or less, corium with a triangular dark patch before apex
(p. 587) (female) **tiliae**
9. Clavus dark brown bordering scutellum only; apical half of membrane clear, a fuscous spot at margin each side of middle, a spot also bordering tip of cuneus (p. 587) **inconspicuus**
Clavus dark brown or fuscous bordering commissure as well as along the scutellum; apical half of membrane rather uniformly infuscated (p. 593) **clavigenitalis**

10. (2) Rostrum extending beyond apices of intermediate coxae 12
Rostrum scarcely attaining apices of intermediate coxae; color
rich yellowish brown, darker on clavus and apically on corium .. 11
11. Antennal segment ii infuscated at apex, length exceeding width of
pronotum at base (p. 585) *viburni*
Antennal segment ii not infuscated, length not equaling width of
pronotum at base (p. 596) *nyssae*
12. Tylus with apical half black; two bands near apices of hind
femora, sides of body, and more or less on head, reddish
(p. 584) *atritylus*
Tylus not black, or if so, then the body and bands on femora not
reddish 13
13. Hind femora distinctly biannulated near apices with darker or with
paler; antennal segment ii infuscated apically 19
Hind femora not distinctly biannulate before apices, when dark,
paler only at extreme tip; antennal segment ii rarely infuscated,
but if so, annuli on femora are indistinct 14
14. Scutellum infuscated, a pale median vitta on apical half; dorsum
dark greenish brown to blackish, a lateral dark fuscous stripe
extending full length of body; femora dark but pale at extreme
tips (p. 583) *invitus*
Scutellum sometimes dark but without indication of a pale median
line 15
15. Hemelytra uniformly ferrugino-testaceous, rich brownish, or fulvo-
aeneous, not appreciably darker on clavus and apical half of
hemelytra 16
Hemelytra not uniformly colored, clavus and apical half of corium
darker than scutellum and basal half of corium 17
16. Hemelytra and femora fulvo-aeneous; membrane distinctly infus-
cated (p. 583) *fagi*
Hemelytra (male) ferrugino-testaceous to blackish, or (female)
uniformly rich brownish; membrane (male) infuscated, or
(female) uniformly yellowish (p. 594) *hirticulus*
17. Antennal segment ii uniformly colored, never distinctly infuscated
apically 18
Antennal segment ii infuscated; clavus and apical half of corium
dark brownish, embolium, outer basal half of corium, and cuneus,
pale translucent; length 5.5-6 mm. (p. 595) *ostryae*
18. Antennal segment ii scarcely exceeding width of pronotum at base;
rostrum scarcely attaining apices of hind coxae; hemelytra green-
ish yellow, apical spot on corium, and inner margins of clavus,
dark brownish to blackish (p. 593) *clavigenitalis*
Antennal segment ii much exceeding width of pronotum at base;
rostrum extending slightly beyond apices of hind coxae; clavus
and corium dark brownish (p. 585) *geneseensis*
19. (13) Color yellowish to brownish, apical half of corium brownish
but not forming a delimited spot; femora distinctly brownish or
reddish 20
Pale greenish yellow, clavus and large spot on apical half of
corium dark brownish black; femora greenish yellow, banded
before apices with pale fuscous (p. 595) *canadensis*
20. Femora and usually the sides of body distinctly reddish; hind
femora annulated before apices with dark reddish (p. 591) *quercalbae*
Femora and sides of body dark brown to fuscous; hind femora
annulated before apex with dark fuscous (p. 592) *omnivagus*
21. (1) Pronotal disk with distinct dark rays or spots behind calli .. 25
Pronotal disk blackish but without distinct rays 22
22. Sides of body and hind femora distinctly reddish, the latter annu-
lated near apices with pale and fusco-reddish ... (p. 591) *quercalbae*
Sides of body and femora not distinctly reddish 23

23. Hind femora greenish to brownish, without subapical annuli 24
 Hind femora blackish, annulated with paler near apices; hemelytra blackish, costal margin scarcely paler, cuneus clear, the apex fuscous (p. 588) *caryae*
24. Embolium greenish, clavus and inner half of corium dark fuscous to blackish (p. 587) (male) *tiliae*
 Embolium scarcely paler, hemelytra and whole dorsum nearly uniform dark brownish black (p. 594) (male) *hirticulus*
25. (21) Hind femora biannulate near apices with brownish black or pale 26
 Hind femora dark brownish to black on apical half but not distinctly biannulate, distinctly pale on apex only 32
26. Antennal segments i and ii black; embolium, outer half of corium, and cuneus, pale translucent (p. 593) *johnsoni*
 Antennal segment i pale or only slightly brownish; embolium apically and outer half of corium darkened, but if not, then antennal segment i distinctly pale 27
27. Sides of body and usually hind femora distinctly reddish
 (p. 590) *communis*
 Sides of body and femora not distinctly reddish 28
28. Embolium infuscated apically, or if not, then the calli and just before with blackish 29
 Embolium and basal half of corium pale, a large blackish spot on apical half of corium; clavus and a nearly quadrate spot behind each callus blackish; calli and just before without blackish
canadensis var. *binotatus*
29. Antennal segment ii distinctly infuscated, at least apically 30
 Antennal segments i and ii yellowish; clavus, apical half of corium and embolium blackish (p. 586) *parrotti*
30. Calli blackish before as well as behind, a small fuscous spot or ray on median line just before or extending between calli 31
 Calli and a widening ray behind each callus blackish, in darkest specimens the whole disk blackish but a distinct pale ray remains between the calli; head and legs usually slightly tinged with reddish; in darkest specimens the scutellum and basal half of corium remain paler (p. 586) *parshleyi*
31. Scutellum except median line apically, and hemelytra except cuneus, dark fuscous to blackish (p. 588) *caryae*
 Scutellum and basal half of corium and embolium distinctly paler
caryae var. *subfuscus*
32. (25) Scutellum with median line infuscated; apex and inner margin of cuneus, femora and more or less on sides of body, reddish (p. 591) *univittatus*
 Scutellum never forming fuscous vitta on median line 33
33. Pronotal disk with small fuscous mark behind each callus; venter fuscous brown, a lateral pale stripe dividing the dark color
 (p. 592) *semivittatus*
 Pronotal disk with distinct black ray or spot behind each callus; sides of venter without pale stripe 34
34. Pronotal disk with black rays behind calli but not attaining basal margin 35
 Pronotal disk with black stripe traversing outer half of callus and extending to basal margin; pale yellowish, clavus and extremity of corium and embolium black (p. 589) *vitticollis*
35. Pronotal disk with two conspicuous black spots, one behind each callus and forming nearly square spots; ground color yellowish brown; hind femora blackish except extreme tips (p. 589) *atrinotatus*
 Pronotal disk with a conspicuous black ray behind each callus, slender but becoming broader distally; ground color yellowish brown with fuscous, distinctly tinged with pink; hind femora reddish brown, indistinctly annulated with paler at apices
 (p. 597) *laureae*

L. (Neolygus) fagi Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 603, 1917.

Male: Length 4.8 mm., width 1.94 mm.; not darker than the female and both sexes look much like the female of *hirticulus*; differs from *hirticulus* by being more fulvo-aeneous in coloration and by the dark fuscous membrane; genital claspers distinctive of the species (fig. 106).

Female: Slightly larger and more robust than the male; very similar to the female of *hirticulus*, but usually distinguishable by the infuscated membrane and in general by the more fulvo-aeneous coloration.

Breeds on *Fagus grandifolia* and perhaps *Betula lutea*.

Massachusetts, New Hampshire, New York, Vermont.



invitus

FIG. 107. *Lygus invitus* Say,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



atritylus

FIG. 108. *Lygus atritylus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (Neolygus) invitus (Say).

Capsus invitus Say, Heter. N. Harm., 24, 1832; Compl. Writ., i, 345, 1859.

Cornell Univ. Agr. Expt. Sta., Bull. 391, pl. 604, 1917.

Male: Length 5 mm., width 2 mm.; dark greenish with fuscous or blackish, sides of the body with a dark fuscous stripe extending the full length of the body, including the whole genital segment; scutellum with a pale median vitta on apical half; disk of pronotum dark brownish or blackish but never with two distinct rays as in *communis*; genital claspers distinctive of the species (fig. 107).

Female: Length 5.1 mm., width 2.2 mm.; slightly more robust than the male, very similar in coloration but in general lighter-colored, the pale vitta on scutellum more extended.

Breeds on *Ulmus americana*.

Danbury, 15 June, 1909 (C. W. J.); New Haven, 25 June, 1920 (B. H. W.); South Meriden, 15 June (H. L. J.); Winnipauk, 16 June, 1909 (C. W. J.).

L. (*Neolygus*) *atritylus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 606, 1917.

Male: Length 5.2 mm., width 2.2 mm.; closely related to *invitus* and *fagi*, the darker forms much resembling a pale or yellowish form of *invitus*; greenish yellow to pale brownish, corium slightly darkened apically with fuscous, cuneus uniformly pale translucent; hind femora with two subapical bands, sides of body, and more or less on head, reddish; easily distinguished by the black tylus and genital claspers (fig. 108).

Female: Length 5.4 mm., width 2.36 mm.; very similar to the male in coloration except that the corium is rarely, if ever, darkened with fuscous.

Breeds on *Salix*.

Allotype: Male, 13 July, 1920, Cranberry Lake, N. Y. (C. J. Drake), taken on *Salix*; author's collection.

New Hampshire, New York, Vermont.

L. (*Neolygus*) *confusus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 606, 1917.

Male: Length 5.3 mm., width 2.05 mm.; green, differs from *alni* in lacking the strong bronze colors, in having a fuscous spot at tip of corium, and in different membrane markings; fuscous spots at base of tibial spines more distinct than in *alni*, and in addi-



FIG. 109. *Lygus confusus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

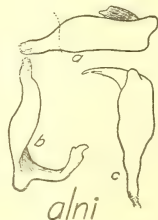


FIG. 110. *Lygus alni* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

tion there are small fuscous spots on lower side of posterior femora; genital claspers distinctive of the species (fig. 109).

Female: Length 4.3 mm., width 2.2 mm.; very similar to the male but more robust, coloration slightly paler.

Allotype: Female, 30 July, 1919, Peaks Island, Me. (G. A. Moore); author's collection.

Maine, New Hampshire, New York.

L. (*Neolygus*) *alni* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 607, 1917.

Male: Length 5.7 mm., width 2 mm.; closely related to *viridis* Fallen, but differs in the male genital claspers, in having the scutellum distinctly darker, and in that the apical part of antennal segment ii is not infuscated; more slender than *viridis*, bright green, bronze on clavus and basally on disk of pronotum, with a more dilute bronze on scutellum and on inner half of corium; tibial spines infuscated at base; genital claspers distinctive (fig. 110).

Female: Not differing from the male in coloration but slightly more robust.

Breeds on *Alnus incana*.

New Hampshire, New York.

L. (*Neolygus*) *geneseensis* Knight.

Cornell Univ. Agr. Exp. Sta., Bull. 391, 609, 1917.

Male: Length 5 mm., width 2.05 mm.; yellowish brown to dark brown and fuscous; allied to *viburni*, having much the same color

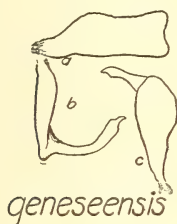


FIG. 111. *Lygus geneseensis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 112. *Lygus viburni* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

but differing by the slightly smaller size, in the longer rostrum, and in the structure of the genital claspers (fig. 111).

Female: Length 4.9 mm., width 2.1 mm.; very similar to the male but more uniformly yellowish brown; distinguished from *viburni* by the uniformly yellowish color of the antennae, and by the length of the rostrum which extends to posterior margins of hind coxae.

Breeds on *Quercus alba*.

Massachusetts, Long Island, N. Y.

***L. (*Neolygus*) *viburni* Knight.**

Cornell Univ. Agr. Expt. Sta., Bull. 391, 609, 1917.

Male: Length 5.2 mm., width 2.08 mm.; width of head 1.03 mm., vertex .38 mm.; smaller than *omnivagus*, and more yellowish

brown; closely related to *geneseensis*, but differs in the male claspers, in being more robust, in having a shorter rostrum, in that apical half of antennal segment ii is infuscated, and having in general a richer yellowish brown color.

Female: Length 5.3 mm., width 2.28 mm.; width of head 1.03 mm., vertex .45 mm.; very similar to the male in coloration but usually not so dark; distinguished from *geneseensis* by the shortness of rostrum, which scarcely attains posterior margins of intermediate coxae, and by the second antennal segment which is darkened on apical half.

Breeds on *Viburnum lentago*.

New Haven, 11 June, 1914 (B. H. W.).

L. (Neolygus) parrotti Knight.

Bull. Brook. Ent. Soc., xiv, 21, 1919.

Male: Length 5.1 mm., width 1.9 mm.; closely related to *viburni* but distinguished by the longer rostrum, fuscous rays on disk of pronotum, antennal segments i and ii yellowish, clavus and apical half of corium fuscous; resembles *parshleyi* but differs in the right genital clasper and in the entirely yellowish segments i and ii of the antennae.

Female: Very similar to the male in size and coloration.

Breeds on *Viburnum sterilis* and *Viburnum opulus*.

New York.

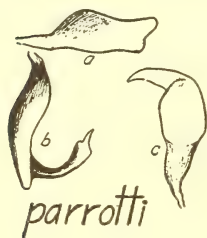


FIG. 113. *Lygus parrotti* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged.—Drawing by Dr. H. H. Knight.

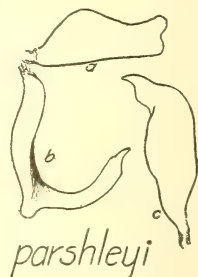


FIG. 114. *Lygus parshleyi* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (Neolygus) parshleyi Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 611, 1917.

Male: Length 4.8 mm., width 2 mm.; closely related to *atrino-tatus* but differs materially in the genital claspers (fig. 114), in not having the blackish rays on pronotum clearly defined as spots, and in general by the more brownish coloration.

Female: Length 5 mm., width 2.1 mm.; the dark colors much reduced, otherwise similar to the male in coloration.

Food plant unknown.

Maine, New Hampshire.

**L. (Neolygus) inconspicuus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 612, 1917.

Male: Length 4.5 mm., width 2.08 mm.; pale greenish, a transverse spot of brownish at apex of corium and dark brownish on clavus bordering scutellum; in general appearance resembling most the female of *tiliae* and both sexes of *clavigenitalis*, but differing greatly from those species in form of genital claspers (fig. 115).

Female: Length 4.8 mm., width 2.25 mm.; very similar to the male in size and coloration; similar in size and general appearance to females of *clavigenitalis* and *tiliae*; distinguished from *tiliae* by the pale scutellum, and from *clavigenitalis* by the more greenish color and paler scutellum.

Breeds on *Vitis rotundifolia*.

New Haven, 23 June (B. H. W.).

**L. (Neolygus) tiliae* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 613, 1917.

Male: Length 4.6 mm., width 1.74 mm.; rather small, scarcely as large as *invitus*; greenish yellow with the base of pronotum darker, the scutellum, clavus, and corium dark fuscous to blackish; genital claspers distinctive (fig. 116).

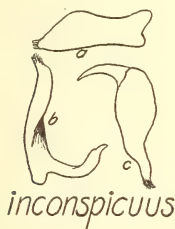


FIG. 115. *Lygus inconspicuus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 116. *Lygus tiliae* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Length 5 mm., width 2 mm.; lighter colored than the male and usually slightly larger; pronotum yellowish, scutellum and clavus only slightly darkened, apex of corium with a triangular dark patch, much resembling *belfragii* in this respect; similar in

size and general appearance to females of *inconspicuus* and *clavigenitalis*; distinguished from *inconspicuus* by having a more conical shape to front of head, and in the darker-colored scutellum; *clavigenitalis* differs in having more brownish and in the paler scutellum.

Breeds on *Tilia americana*.

Danielson, 21 June, 1920 (J. T. Ashworth); Middletown, 17 June, 1909 (C. W. J.); Poquonock, 27 June, 1905 (H. L. V.).

***L. (*Neolygus*) *caryae* Knight.**

Cornell Univ. Agr. Expt. Sta., Bull. 391, 615, 1917.

Male: Length 5.4 mm. (variation 4.8-5.7 mm.), width 2.1 mm.; dark brownish to black, cuneus pale and thus superficially resembling *Neoborus geminus* (Say); the paler brown forms suggest *Lygus omnivagus*; genital claspers distinctive (fig. 117).

Female: Length 5.5 mm. (variation 5-6.3 mm.), width 2.3 mm.; more robust than the male, frequently with brownish yellow between the calli and extending back over the disk.

Breeds on hickory (*Carya*).

Branford, 8 June, 16 June (B. H. W.); New Haven, 21 June, 24 June, 1905 (B. H. W.); Portland, 5 June, 1914 (B. H. W.); Yalesville, 27 June, 1907 (B. H. W.).

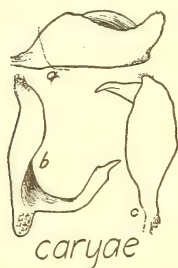


FIG. 117. *Lygus caryae* Knight, —male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 118. *Lygus atrinotatus* Knight, —male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

***L. (*Neolygus*) *caryae* var. *subfuscus* Knight.**

Cornell Univ. Agr. Expt. Sta., Bull. 391, 616, 1917.

A yellowish brown color form which differs greatly in general aspect from the typical *caryae*, very much resembling *omnivagus* in coloration. Antennal segment ii brownish with fuscous, basal one-third and frequently one-half, yellowish brown as segment i. Yellowish brown, pronotum with two black spots, one behind each eye and frequently extending back over the calli thus forming two

black rays; scutellum pale yellowish, frequently fuscous at base, in darker specimens a fuscous median line extending from base toward apex. Hemelytra in color very much resembling those of *omnivagus*, but the two black rays on pronotum, and the dark color of the scutellum appearing along the median line, distinguish this variety at once from that species.

Branford, 8 June, 13 June (B. H. W.); Portland, 5 June, 1914 (B. H. W.); South Meriden, 7 June (H. L. J.).

L. (Neolygus) atrinotatus Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 617, 1917.

Male: Length 4.7 mm., width 2.08 mm.; resembles *canadensis* var. *binotatus* and certain color forms of *parshleyi*, but differs greatly in the genital claspers (fig. 118); yellowish brown, antennal segment ii and two conspicuous spots on pronotum black; clavus, apical half of corium, and narrow lateral margins of scutellum, blackish; a blackish stripe on the sides extending for full length of body.

Female: Length 5.5 mm., width 2.3 mm.; slightly larger and more robust than the male but very similar in coloration.

District of Columbia, North Carolina, Pennsylvania.



FIG. 119. *Lygus vitticollis* Reuter,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

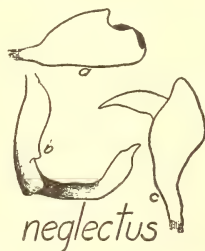


FIG. 120. *Lygus neglectus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (Neolygus) vitticollis Reuter.

Lygus vitticollis Reuter, Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 71, 1876.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 618, 1917.

Male: Length 5.8 mm., width 2.48 mm.; elongate, easily distinguished by its large size and black markings; pale yellowish, two rays on pronotum, clavus, apical half of posterior femora, apices of corium and embolium, black; rostrum reaching only upon intermediate coxae; genital claspers (fig. 119) distinctive.

Female: More robust than the male but not differing in coloration.

Breeds on *Acer saccharum* and *Acer rubrum*.

Branford, 8 June (B. H. W.); Cornwall, 23 June (K. F. C.); Danbury, 15 June, 1909 (C. W. J.); Eastford, 12 June (B. H. W.); East River, Aug., 1910 (C. R. E.); Litchfield, 20 June, 1908 (L. B. W.); New Haven, 9 June, 1905, 16 June, 1921 (B. H. W.).

L. (*Neolygus*) *neglectus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 619, 1917.

Male: Length 5.2 mm., width 2.3 mm.; bright green, robust, shorter and broader than *pabulinus*; easily distinguished from that species by the presence of a distinct carina on base of vertex; head, calli, and ventral side of body, becoming yellowish; a small fuscous cloud on anal area of membrane and inner angles of cuneus; genital claspers (fig. 120) distinctive.

Female: Length 5.6 mm., width 2.4 mm.; very similar to the male but more robust in form.

Breeds on *Carpinus caroliniana*.

Massachusetts.

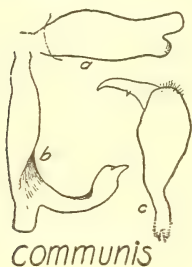


FIG. 121. *Lygus communis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

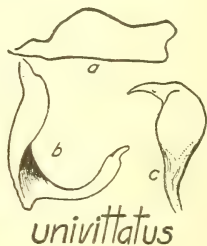


FIG. 122. *Lygus univittatus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (*Neolygus*) *communis* Knight.

Can. Ent., xlviii, 346, 1916.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 620, 1917.

Male: Length 5.5 mm., width 2.3 mm.; greenish and darkened with brownish and fuscous; suggestive of *invitus* but easily distinguished by the two black rays on disk of pronotum, by the reddish color in lateral stripe of the body, and by the larger size; differs structurally by absence of longitudinal line on vertex and in the form of the genital claspers (fig. 121).

Female: More robust than the male, scarcely differing in coloration although usually slightly paler.

Breeds on *Cornus stolonifera*, *C. paniculata*, and the cultivated pear. Commonly known as the "false tarnished plant bug," and is a destructive pest on pears in New York and on apples in Nova Scotia.

Middletown, 17 June, 1909 (C. W. J.); South Meriden, June, 1915 (H. L. J.).

L. (*Neolygus*) *univittatus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 623, 1917.

Male: Length 5.3 mm., width 2.2 mm.; resembling *laureae* in coloration, but smaller than that species; similar in size to large forms of *quercalbae* but darker colored and with reddish; distinguished by having a median longitudinal fuscous vitta on the scutellum; antennal segment i black, two blackish rays on disk of pronotum behind the calli, apex of cuneus reddish; genital claspers distinctive (fig. 122).

Female: Length 5.4 mm., width 2.4 mm.; more robust than the male but very similar in coloration.

Breeds on *Crataegus*.

New York.



FIG. 123. *Lygus quercalbae* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 124. *Lygus semivittatus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (*Neolygus*) *quercalbae* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 624, 1917.

Male: Length 5.7 mm., width 2.4 mm.; resembles *omnivagus* but is more reddish brown in color, differs in being more robust and in having a pale stripe through the fuscous on sides of venter; similar to *semivittatus* in coloration of the venter, but differs in not having distinct fuscous spots behind the calli and in general by the more reddish color; genital claspers (fig. 123) distinctive.

Female: Length 5.6 mm., width 2.6 mm.; more robust than the male, but very similar in coloration; larger and more reddish than *omnivagus* and *semivittatus*; distinguished by pale stripe on sides of venter and by absence of fuscous spots behind the calli, also by the distinctly reddish color on hind femora and sides of body.

Breeds on *Quercus alba*.

New Haven, 7 July, 1920 (B. H. W.); Orange, 22 June, 1920 (B. H. W.).

L. (*Neolygus*) *semivittatus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 626, 1917.

Male: Length 5.3 mm., width 2.28 mm.; resembles *omnivagus* in coloration of the hemelytra; two small fuscous marks on disk behind calli; very suggestive of *caryae* var. *subfuscus* but differs by having a pale stripe through the fuscous on sides of venter; similar to *quercalbae* in having the venter fuscous brown and with pale stripe dividing the dark color, but distinguished at once by the fuscous marks on pronotum; genital claspers distinctive (fig. 124).

Female: Length 5.4 mm., width 2.2 mm.; very similar to the male in coloration but with less fuscous on the hemelytra; most easily confused with *caryae* var. *subfuscus* but distinguished by the longitudinal pale stripe running through the fuscous color on sides of venter.

Breeds on *Quercus alba*.

Long Island, N. Y.

*L. (*Neolygus*) *omnivagus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 627, 1917.

Male: Length 5.4 mm., width 2.2 mm.; yellowish brown, corium dark brownish to fuscous apically, clavus dark brownish or blackish; very much resembling forms of *semivittatus* and *quercalbae*, also might be confused by coloration with *caryae* var. *subfuscus*; genital claspers distinctive (fig. 125).

Female: Length 5.4 mm., width 2.5 mm.; usually paler than the male, more yellowish brown; never with reddish as in *quercalbae*, nor with fuscous marks on the pronotum as in *semivittatus* or in *caryae* var. *subfuscus*; very similar to *canadensis* but that species has the apical one-third of antennal segment ii more distinctly black, the fuscous spot on the apex of the corium smaller and not invading the pale embolium.

Breeds on *Quercus alba*, *Q. rubra*, *Q. coccinea*, and probably other oaks; breeds occasionally on *Cornus*, *Castanea*, and *Viburnum*.

Branford, 28 July, 1905 (H. L. V.); Danbury, 15 June, 1909 (C. W. J.); Darien, 10 June, 1912 (C. W. J.); Double Beach, 5 June (H. L. V.); Litchfield, 8 Aug., 1912 (L. B. W.); Middletown, 17 June, 1909 (C. W. J.); New Haven, 8 June, 1904, 4 July, 1920 (B. H. W.).

***L. (Neolygus) johnsoni Knight.**

Cornell Univ. Agr. Expt. Sta., Bull. 391, 629, 1917.

Male: Length 5.7 mm., width 2.3 mm.; resembles *communis* in having two prominent black spots on pronotum, but is distinguished at once by the clear outer margin of hemelytra and the dark fuscous inner half of corium; the long, thick, upturned prong of the left genital clasper is distinctive of the species (fig. 126).

Female: Slightly more robust than the male but similar in coloration.

Breeds on *Carpinus caroliniana*.

Hamden, 20 June, 1920 (B. H. W.); Middletown, 17 June, 1909 (C. W. J.), type locality.

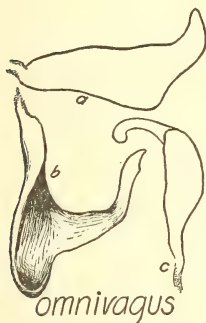


FIG. 125. *Lygus omnivagus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

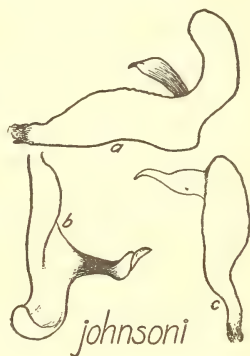


FIG. 126. *Lygus johnsoni* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (Neolygus) belfragii Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 71, 1876.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 630, 1917.

Male: Length 5.8 mm., width 2.28 mm.; elongate, green or greenish yellow, clavus brownish and tinged with fuscous and bronze, apex of corium with a triangular fuscous or blackish patch, membrane fuscous longitudinally through the middle; general aspect resembling *confusus*, *alni*, and females of *tiliae*; genital claspers distinctive (fig. 127).

Female: Length 5.5-5.8 mm.; similar to the male in coloration but in form more robust.

Breeds on *Acer spicatum* and *Viburnum acerifolium*.

Bradford, 13 June, 1920 (B. H. W.); New Haven, 28 June, 1920 (B. H. W.).

L. (Neolygus) clavigenitalis Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 632, 1917.

Male: Length 4.8 mm., width 2.17 mm.; yellowish brown, with darker brown on the clavus and apex of corium; resembling most the female of *tiliae*, and both sexes of *inconspicuus*; differs from those species by lacking the green, in having the pronotum evenly shaded with yellowish brown, and in being more brownish than fuscous on the hemelytra; genital claspers very distinctive of the species (fig. 128).

Female: Length 5.1 mm., width 2.3 mm.; slightly larger and more robust than the male but very similar in coloration; most likely to be confused with the females of *tiliae* and *inconspicuus*, also resembling the pale forms of *viburni* and *geneseensis*. Points of difference are: *inconspicuus* is more greenish and the fuscous marks on clavus and apex of corium are more in contrast; *tiliae* is more green, particularly the pronotum, and the scutellum is darkened with fuscous; *viburni* has nearly the whole corium brownish, apex of embolium darkened, and the apical half of antennae fuscous; *geneseensis* is very similar to *viburni* except that the antennae are not fuscous, but the embolium is darkened to even a greater extent.

Litchfield, 22 July, 1920 (P. G.).

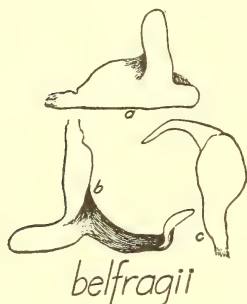


FIG. 127. *Lygus belfragii* Reuter,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

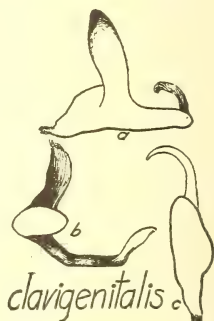


FIG. 128. *Lygus clavigenitalis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

L. (*Neolygus*) *hirticulus* Van Duzee.

Lygus tenellus Van Duzee, Buff. Soc. Nat. Sci., Bull. x, 484, 1912.
Cornell Univ. Agr. Expt. Sta., Bull. 391, 633, 1917.

Male: Length 4.8 mm., width 2.28 mm.; dark ferrugino-testaceous, sometimes entirely dark fuscous or blackish excepting the legs and antennae; genital claspers distinctive (fig. 129).

Female: Length 5.3 mm., width 2.3 mm.; slightly larger and more robust than the male; uniformly colored with yellowish brown or in some cases dark brown, hemelytra rarely much darker than pronotum; could easily be confused with *fagi*, but may be distinguished by the membrane which is uniformly and faintly tinged with fuliginous and is never dark as in *fagi*.

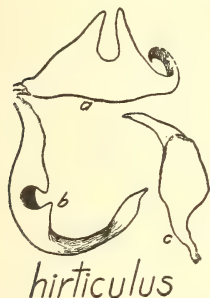


FIG. 129. *Lygus hirticulus* Van Duzee,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

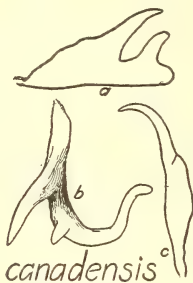


FIG. 130. *Lygus canadensis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Breeds sparingly on several plants; reared from chestnut, beech, and woodbine.

New Haven, 25 June, 1920 (B. H. W.).

L. (Neolygus) canadensis Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 634, 1917.

Male: Length 5.5 mm., width 2.08 mm.; resembles *omnivagus* in general appearance; yellowish brown, clavus and apex of corium dark brownish, margins of the scutellum sometimes brownish; genital claspers distinctive (fig. 130).

Female: Slightly more robust than the male, usually with less dark brown on the hemelytra.

New Jersey, New York.

L. (Neolygus) canadensis var. *binotatus* Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 635, 1917.

Male genital claspers similar to those of *canadensis*, but differs at least in having a very distinct ray behind each callus which extends to near basal margin of the disk; scutellum appears more convex and with dark brownish at the sides.

New Jersey, New York.

L. (Neolygus) ostryae Knight.

Cornell Univ. Agr. Expt. Sta., Bull. 391, 635, 1917.

Male: Length 5.8 mm., width 2.36 mm.; resembles pale and yellowish specimens of *belfragii*, usually slightly larger and more strongly yellowish brown in color; embolus and basal half of corium pale yellowish, clavus and apical half of corium brownish to dark brown, cuneus clear tinged with yellow; readily distinguished by the two unusually large upturned prongs of the left genital clasper (fig. 131).

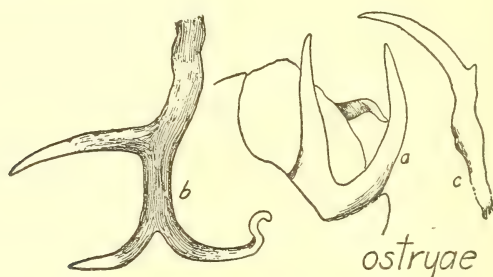


FIG. 131. *Lygus ostryae* Knight,—male genital claspers, (a) genital segment, left lateral aspect, (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Length 6 mm., width 2.4 mm.; similar to the male in coloration but in form slightly larger and more robust.

Breeds on *Ostrya virginiana*.

Massachusetts, New York, Vermont.

L. (Neolygus) nyssae Knight.

Bull. Brook. Ent. Soc., xiii, 43, 1918.

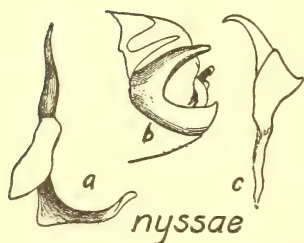


FIG. 132. *Lygus nyssae* Knight,—male genital claspers, (a) left clasper, dorsal aspect, (b) lateral aspect of left clasper and tip of venter, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

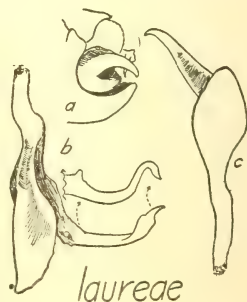


FIG. 133. *Lygus laureae* Knight,—male genital claspers, (a) genital segment, left lateral aspect, (not to scale), (b) left clasper, dorsal aspect, (c) right clasper, ventral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

Male: Length 5.5 mm., width 2.5 mm.; slightly more robust but in general structure similar to *quercalbae*; pronotum and scutellum evenly shaded with rich brown, clavus and corium darker brown; genital claspers distinctive of the species (fig. 132), most closely related to *laureae*.

Female: Length 5.6 mm., width 2.57 mm.; very similar to the male in size and coloration.

Breeds on sour gum (*Nyssa* sp.).

Lyme, 16 June, 1919 (B. H. W.).

L. (*Neolygus*) *laureae* Knight.

Cornell, Univ. Agr. Expt. Sta., Bull. 391, 636, 1917.

Male: Length 6 mm., width 2.4 mm.; resembles *communis* but is larger; yellowish brown, tinged with pink; form of genital claspers very unusual and distinctive (fig. 133).

Female: Length 6.4 mm., width 2.6 mm.; similar to the male but slightly more robust, and everywhere with more reddish; sides of the thorax and venter with more reddish than fuscous.

Breeds on mountain laurel (*Kalmia latifolia*).

New York, Pennsylvania.

***Dichrooscytus* Fieber.**

D. *suspectus* Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 37, 1909.

Length 5 mm., width 2 mm.; very similar to *rufipennis* Fallen, if not identical; yellowish green, base of scutellum, hemelytra except embolium and inner angles of cuneus, deep reddish; membrane lightly infumed, veins reddish.

Breeds on *Pinus resinosa* and *P. sylvestris*.

Stonington, 15 July, 1914 (I. W. Davis).

D. *elegans* Uhler.

Proc. U. S. Nat. Mus., xxvii, 356, 1904.

Length 3.5 mm., width 1.5 mm.; bright green below, greenish above but tinged with reddish on hemelytra; in color quite resembling a small form of *suspectus*.

Food plants: Red cedar (*Juniperus virginiana*) and white cedar (*Thuja occidentalis*).

New York.

D. *viridicans* Knight.

Bull. Brook. Ent. Soc., xiii, 114, 1918.

Male: Length 3.2 mm., width 1.25 mm.; very similar in structure to *elegans*, but bright green in color, the pubescence on pronotum blackish and more conspicuous; head, coxae, and femora, often becoming pale to brownish; pronotum and scutellum sometimes more yellowish green than bright green; cuneus green, margins on the apical half reddish; membrane fuscous, cell veins sometimes reddish.

Female: Length 3.3 mm., width 1.4 mm.; slightly more robust than the male but not differing in coloration.

Breeds on red cedar (*Juniperus virginiana*); sometimes found in company with *elegans* but of numerous specimens examined no variation is evident which would indicate that we are dealing with forms of a single species.

Allotype: Male, 11 July, 1920, Taghanic, N. Y. (H. H. Knight); author's collection.

Long Island, N. Y.

Polymerus Hahn. (*Poeciloscytus* Authors).

Key to Species.

1. Rostrum reaching upon hind coxae, or slightly beyond 2
Rostrum not reaching upon hind coxae 4
2. Rostrum scarcely attaining hind margins of posterior coxae 3
Rostrum reaching slightly beyond posterior coxae; yellowish brown and darkened with fuscous, cuneus red, or rarely paler **basalis**
3. Dorsum with pale and black; apical half of femora fulvous, tibiae pale; cuneus, and scutellum except basal angles, pale **nigropallidus** n. sp.
Dorsum uniformly black, or only very narrowly pale on tip of embolium and cuneus; apical half of femora reddish brown but with a subapical paler annulus; tibiae stained with reddish **tinctipes** n. sp.
4. Rostrum reaching upon middle coxae 5
Rostrum not reaching beyond hind margin of sternum 6
5. Rostrum attaining hind margins of middle coxae; dorsum black, narrow apex of cuneus and slenderly each side of fracture, pale; tibiae uniformly black **proximus** n. sp.
Rostrum just attaining middle of intermediate coxae; dorsum black and with pale, tip of scutellum and basal angle of corium pale, cuneus with pale, red, and black **unifasciatus**
6. Rostrum not reaching beyond middle of sternum 7
Rostrum nearly attaining posterior margin of sternum; legs rather uniformly fulvous but hind femora with a small group of fuscous points on anterior face at middle of apical half **punctipes** n. sp.
7. Tibiae fulvous or with pale 8
Tibiae black 9
8. Legs uniformly fulvous; cuneus and embolium pale or fulvous .. **fulvipes** n. sp.
Legs red, apical one-third of femora black; tibiae yellowish, apices, and more or less broadly at base, black; antennal segment ii yellowish, blackish apically **venustus** n. sp.
9. Rostrum reaching behind front coxae, or to near middle of sternum 10
Rostrum scarcely attaining hind margins of front coxae; femora red with only apices black **gerhardi** n. sp.
10. Cuneus red; male with coxae black, and antennal segment ii distinctly more slender than segment i; coxae yellow in female; dorsum black, somewhat shining, clothed with silvery sericeous pubescence **venaticus**
Cuneus black; male with coxae yellow as in the female, antennal segment ii equally thick as segment i; dorsum deep black, opaque, scutellum and hemelytra clothed chiefly with black pubescence .. **opacus** n. sp.

P. basalis (Reuter).

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 73, 1876.

Length 3.7-4.8 mm., width 1.7-2.3 mm.; pale to yellowish and darkened with fuscous and black; hemelytra yellowish translucent, clavus and apical half of corium chiefly fuscous; scutellum black, apex more or less pale; cuneus red, sometimes the embolium and legs also tinged with reddish; posterior femora with two subapical fuscous bands; clothed with silvery sericeous pubescence which appears golden yellow in certain lights.

Food plant: Dog fennel (*Anthemis*).

East River, Sept., 1910 (C. R. E.); New Haven, 24 June, 1920 (E. J. S. M.), 20 July, 1904 (W. E. B.), 12 July, 1916 (M. P. Z.); 16 June, 1920, 6 July, 1911, 28 Aug., 1910 (B. H. W.); Orange, 23 July, 1904 (P. L. B.).

P. nigropallidus Knight, new species.

Male: Length 4.3 mm., width 1.8 mm. Head: Width 1 mm., vertex .34 mm.; collum broadly exposed; black, carina, spot each side of vertex bordering eye, median line on vertex and front, lora, bucculae, and stripe each side of gula, pale; head shaped nearly as in *basalis*. Rostrum, length 1.72 mm., nearly attaining hind margins of posterior coxae, yellowish, apex blackish.

Antennae: Segment i, length .40 mm., black; ii, 1.63 mm., cylindrical, nearly equal in thickness to segment i, black, clothed with short black pubescence; iii, .74 mm., black; iv, missing.

Pronotum: Length .93 mm., width at base 1.6 mm.; obscurely transversely rugulose, moderately shining, clothed with sericeous, pale to yellowish pubescence; black, collar, anterior margins of calli and just before, between calli and a rather broad spot on median line of disk but rarely reaching basal margin, basal margin but more broadly at basal angles, pleura except near dorsal margin, pale to yellow. Scutellum pale or yellow, basal angles and the mesoscutum black; finely transversely rugulose, yellowish pubescent. Sternum yellowish to brownish; pleura yellowish, ostiolar peritreme pale.

Hemelytra: Embolar margins only very slightly arcuate; pale, inner half of clavus and slightly bordering claval suture, blackish; apical half of corium with a blackish stripe lying just within radial vein, the outer margin bordering embolium blackish except near apex; cuneus pale translucent, clothed with dark pubescence as on apical half of embolium and outer margin of corium; clavus except bordering commissure, and inner half of corium, clothed with yellowish sericeous pubescence. Membrane uniformly dark fuscous, veins and narrowly bordering apex of cuneus, pale.

Legs: Fulvous, coxae and tibiae more yellowish or testaceous, spines and pubescence black; hind femora with two or three fine fuscous points on ventral margin; apical tarsal segment and a spot on knee of posterior tibia, fuscous. Venter rather uniformly bright yellow, pale pubescent.

Female: Length 4.5 mm., width 2.3 mm.; very similar to the male, the pronotum somewhat more broadly pale; basal angle of cuneus reddish.

Holotype: Male, 23 June, 1907, Brown's Mills Junction, N. J.; author's collection. *Allotype*: same data as the type. *Paratypes*: Male and females (3), taken with the types. Specimens kindly presented to the writer by Dr. C. J. Drake.

***Polymerus tinctipes* Knight, new species.**

Male: Length 3.7 mm., width 1.63 mm. Head: Width .94 mm., vertex .44 mm.; black, each side of vertex with a yellow spot bordering eye; clothed with pale sericeous pubescence. Rostrum, length 1.66 mm., attaining or slightly exceeding hind margins of posterior coxae, piceous, yellowish at joints, basal segment chiefly reddish.

Antennae: Segment i, length .33 mm., black; ii, 1.40 mm., cylindrical, more slender at base but apical half equal in thickness (.086 mm.) to segment i, black, closely set with yellowish and dusky pubescence; iii, .66 mm., blackish, somewhat thickened, tapering to more slender apically; iv, .50 mm., slender, brownish black.

Pronotum: Length .78 mm., width at base 1.40 mm.; black, obsoletely rugulose, lower pleural margin and the xyphus pale; clothed with simple pale and sericeous silvery pubescence. Scutellum black, transversely rugulose, clothed with sericeous white pubescence. Sternum and pleura black, silvery pubescent; ostiolar peritreme fuscous, posterior margin somewhat yellowish.

Hemelytra: Embolar margins moderately arcuate; obsoletely scabriculous, slightly shining; clothed with sericeous silvery pubescence; black, narrow apex of embolium and of cuneus pale. Membrane uniformly dark fusco-brownish, narrowly paler bordering apex of cuneus, veins brownish.

Legs: Coxae pale, a black spot on basal angle; femora yellowish, apical half reddish but divided by a yellowish annulus, ventral margin with an irregular row of six to eight fuscous dots, each dot formed at base of a prominent hair; tibiae reddish over a yellowish background, spines, pubescence, and spot on knee, black; tarsi fuscous. Venter black, clothed with white and dusky pubescence.

Female: Length 4.2 mm., width 2.1 mm.; embolar margins strongly arcuate; more robust than the male but very similar in coloration, the pale spots on vertex and tip of embolium slightly enlarged; antennal segment ii more slender than in the male, not attaining thickness of segment i.

Holotype: Male, 3 May, 1915, Great Falls, Md. (J. D. Hood); collection of W. L. McAtee. *Allotype*: taken with the type; author's collection. *Paratypes*: Males (2), taken with the types (J. D. Hood); collected "on lichen covered rock."

P. proximus Knight, new species.

Closely related to *nigritus* Fallen but distinguished by the uniformly dark tibiae; length of antennal segment i equal to width of vertex while in *nigritus* segment i is shorter.

Male: Length 5.3 mm., width 2.7 mm. Head: Width 1.13 mm., vertex .54 mm.; black, a yellowish spot each side of vertex near eye. Rostrum, length 1.8 mm., barely attaining hind margins of middle coxae, black, segment ii brownish.

Antennae: Segment i, length .60 mm., thickness .114 mm., black; ii, 2.2 mm., cylindrical, thickness .086 mm., brownish black, deep black at base, clothed with brownish pubescence; iii, .85 mm., dark brownish; iv, missing.

Pronotum: Length 1.18 mm., width at base 2.1 mm., posterior half of disk strongly convex, transversely wrinkled, uniformly deep black, slightly shining; clothed with yellowish to sericeous pubescence. Scutellum deep black, slender apex yellowish, transversely wrinkled. Sternum and pleura black, ostiolar peritreme pale to yellowish, becoming darker above.

Hemelytra: Embolar margins moderately arcuate; black, anal ridge, slender tip of embolium, and narrow base and apex of cuneus, pale; opaque, slightly shining, clothed with yellowish and black pubescence intermixed. Membrane and veins uniformly dark fuscous.

Legs: Uniformly black, in paler forms the tibiae uniformly brownish black but with no indication of annulations. Venter uniformly black, clothed with pale to yellowish pubescence.

Female: Length 5.3 mm., width 2.8 mm.; embolar margins more strongly arcuate than in the male, but general coloration similar. Head: Width 1.11 mm., vertex .57 mm. Antennae: Segment i, length .57 mm., thickness .10 mm.; ii, 1.7 mm., thickness .08 mm., cylindrical, more slender than in the male.

Holotype: Male, Greensburg, Pa. (Wirtner); Cornell Univ. collection. Allotype: 18 May, 1905, Columbia, Mo. (C. R. Crosby). Paratype: Male, 12 June, 1922 Faribault, Minn. (H. H. Knight).

P. unifasciatus Fabricius var. **lateralis** (Hahn).

Phytocoris lateralis Hahn, Wanz. Ins., ii, 85, fig. 169, 1834.

Reuter, Hem. Gymn. Eur., v, 55, 361, 1896.

Length male 5.6 mm., width 2.6 mm.; female, length 5.2 mm., width 2.65 mm.; clothed with golden, sericeous tomentose pubescence, and intermixed with blackish pubescent hairs; black, scutellum apically, basal angle of corium, anal ridge and invading inner angle of corium, apically on embolium and corium bordering cuneus, base and apex of cuneus, tibiae, apical one-third of front and middle femora, basal half and two subapical bands on hind femora, pale to testaceous; basal one-third of antennal segment ii, but more broadly in the female, testaceous to brownish; cuneus with inner half red, outer margin black except for pale at base and

apex; membrane fuscous, veins and central area paler, a small clear spot bordering apex of cuneus.

Breeds on *Galium boreale* in Minnesota.

Colorado, Minnesota, New York, Canada, Maine.

The typical *unifasciatus* is more broadly pale than variety *lateralis*, the embolium and corium pale except for a small fuscous patch on apical area of corium. Specimens of the typical form from North America have not been examined by the writer.

Polymerus punctipes Knight, new species.

Legs, embolium, and outer margins of cuneus, fulvous; hind femora with a small group of fuscous points on anterior face at middle of apical half.

Male: Length 4.6 mm., width 2 mm. Head: Width .97 mm., vertex .47 mm.; black, a yellow spot each side of vertex bordering eye; yellowish pubescent. Rostrum, length 1.23 mm., almost attaining hind margin of sternum, yellowish, apex blackish.

Antennae: Segment i, length .51 mm., black, narrowly yellowish at base; ii, 1.85 mm., nearly cylindrical, slightly thicker on middle, nearly equal in thickness to segment i, black, clothed with black and pale pubescence intermixed; iii, .66 mm., yellowish and tinged with dusky; iv, .80 mm., dusky.

Pronotum: Length 1 mm., width at base 1.7 mm.; black, slightly shining, disk transversely rugulose; clothed with pale and yellowish sericeous pubescence. Scutellum black, transversely rugulose, clothed with yellowish pubescence, more sericeous on basal angles. Sternum and pleura black; ostiolar peritreme yellow, becoming dusky on anterior lobe.

Hemelytra: Embolar margins slightly arcuate on apical half; black, embolium and outer margin of cuneus yellowish or fulvous; surface scabriculous, slightly shining, clothed with golden sericeous pubescence and intermixed with darker pubescent hairs. Membrane rather uniformly fusco-brownish, a small nearly clear spot bordering apex of cuneus, veins yellowish.

Legs: Fulvous, spot on knee and apical tarsal segment blackish; hind femora with a group of from two to five fuscous points on anterior face at middle of apical half, a prominent hair arising from each of the two lower points; pubescence pale to yellowish, but blackish on apical half of femora. Venter black, clothed with pale to yellowish pubescence.

Female: Length 5.2 mm., width 2.4 mm.; embolar margins strongly arcuate on apical half; pubescence and color similar to that of the male. Rostrum, length 1.31 mm., nearly attaining hind margin of sternum.

Holotype: Male, 4 July, 1915, Four Mile, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: DISTRICT OF COLUMBIA—Female, 12 June, 1906, Brightwood (O. Heidemann). FLORIDA—Female, "Jacksonville." MAINE—Male, 22 July, 1909, Machias (C. W.

Johnson). MARYLAND—Males (2) and female, 4 June, 1914, Branchville to Beltsville (W. L. McAtee). MINNESOTA—Female, 8 July, 1921, Lake City (A. A. Nichol). Female, "Minn." NEW YORK—Males (12) and females (18), taken with the types. Male, 7 July, 1917, female, 5 July, 1920, Cranberry Lake (C. J. Drake). OHIO—Male, 11 June, 1917, Sugar Grove (C. J. Drake). QUEBEC—Female, 6 July, 1918, Montreal (G. A. Moore).

The writer swept this species from scattering plants of *Lysimachia quadrifolia* which were found growing along an old clay roadway.

***P. fulvipes** Knight, new species.

Closely related to *punctipes* but distinguished by the shorter rostrum; cuneus, embolium, and legs, fulvous.

Male: Length 4.5 mm., width 2.2 mm. Head: Width .94 mm., vertex .43 mm.; black, a yellow spot each side of vertex bordering eye; yellow pubescent. Rostrum, length .97 mm., just attaining middle of sternum, yellowish, apex blackish.

Antennae: Segment i, length .48 mm., yellow, apex and pubescence black; ii, 1.71 mm., thickness .114 mm., cylindrical, equal in thickness to segment i but narrowed at base; iii, .54 mm., fuscous; iv, .68 mm., blackish.

Pronotum: Length 1.04 mm., width at base 1.73 mm.; black, nearly as in *punctipes*, pubescence golden yellow. Scutellum black, minutely transversely rugulose, clothed with sericeous golden pubescence. Sternum and pleura black, ostiolar peritreme yellow.

Hemelytra: Embolar margins slightly arcuate; black, embolium and cuneus fulvous, surface scabriculous, slightly shining, clothed with sericeous, deep golden pubescence, and intermixed apically with a few dark pubescent hairs. Membrane dark fuscous, a narrow pale spot bordering apex of cuneus, veins yellowish.

Legs: Fulvous, tarsi and tips of tibiae fuscous; hind femora usually with one small fuscous dot at base of a prominent hair, set on anterior face at middle of apical half. Venter black, yellow to golden pubescent.

Female: Length 5.1 mm., width 2.6 mm.; embolar margins more distinctly arcuate than in male; similar to the male in pubescence and color, but antennal segment ii slightly more slender. Rostrum, length 1.04 mm., just attaining middle of venter, fulvous, blackish at apex.

Holotype: Male, 4 July, 1915, Four Mile, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: CONNECTICUT—Females (2), 14 June, 1920, New Haven (B. H. Walden). Males (2), 21 June, 1921, Danielson (J. T. Ashworth). Male, 26 June, 1916, South Meriden (H. L. Johnson). NEW YORK—Male and female, taken with the types. Females (4), 4-7 July, 1915, Bayshore, Long Island (C. E. Olsen). Female, 14 June, 1909, Pinelawn, Long Island (Wm. T. Davis). NORTH CAROLINA—Female, 30 June, 1912, Black Mountains (Beutenmuller). Males (2) and females (2), 8 June, 1916, Craggy Mountains (R. W. Leiby). SOUTH DAKOTA—Female, 25 June, 1919, Brookings (H. C. Severin).

Polymerus opacus Knight, new species.

Dorsum black, opaque, clothed with silvery and dusky, sericeous pubescence; antennal segment ii of male equal in thickness to segment i, slightly more slender in the female; legs black, coxae and basal half of femora yellowish.

Male: Length 4.3 mm., width 2 mm. Head: Width .91 mm., vertex .46 mm.; black, a small yellowish spot each side of vertex bordering eye; clothed with sericeous silvery pubescence and intermixed with dusky simple pubescence. Rostrum, length .94 mm., just attaining middle of venter, piceous, yellowish on joints.

Antennae: Segment i, length .49 mm., thickness .114 mm., black; ii, 1.74 mm., cylindrical, thickness .114 mm., narrowed at base, black, rather closely dusky pubescent and beset with more prominent black pubescent hairs; iii, .64 mm., tapering from thicker at base to more slender at apex, brownish black; iv, .66 mm., blackish.

Pronotum: Length .91 mm., width at base 1.6 mm.; black, scarcely shining, surface minutely granulate; clothed with sericeous silvery pubescence; anterior angles with a glabrous opaque spot, present in other species but more conspicuous in this form; lower pleural margin narrowly pale just before coxal cleft. Scutellum transversely rugulose, silvery to dusky pubescent. Sternum dull black, median line yellowish, pleura black; ostiolar peritreme yellowish, anterior lobe becoming fuscous.

Hemelytra: Embolar margins distinctly arcuate; black, opaque, clothed with silvery to dusky, sericeous pubescence; cuneus uniformly black, dark pubescent. Membrane uniformly brownish black, narrowly paler bordering apex of cuneus, veins yellowish to dusky.

Legs: Black, coxae, basal half of femora, and two basal segments of tarsi, yellow to fulvous; a nearly obsolete, narrow yellowish annulus just beneath knee.

Female: Length 4.8 mm., width 2.4 mm.; more robust and embolar margins more strongly arcuate than in the male, but very similar in coloration. Rostrum, length 1.06 mm., just attaining middle of sternum.

Breeds on *Aster umbellatus*.

Holotype: Male, 3 July, 1920, McLean Bogs, Tompkins County, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males (16) and females (10), taken with the types on *Aster umbellatus*. MAINE—Male and females (2), 19 July, males (4) and females (7), 22 July, female, 25 July, females (2), 26 July, 1909, Machias (C. W. Johnson). NEW YORK—Male, 20 July, 1917, males (2) and females (2), 3 Aug., male, 25, Aug., 1920, The Plains (C. J. Drake). VERMONT—Female, 11 July, 1908, Mt. Ascutney (C. W. Johnson). ONTARIO—Males and females (18), 10 July, female, 15 July, males (2) and females (2), 27 July, Parry Sound (H. S. Parish).

P. venaticus (Uhler).

Uhler, Hayden's Surv. Terr., Rept. for 1871, 414, 1872.

Male: Length 5.9 mm., width 2.3 mm.; hemelytra elongate, tip of abdomen attaining middle of cuneus, embolar margins very

slightly arcuate; black, moderately shining; thickly clothed with sericeous, pale pubescence, a few black hairs on embolium and cuneus; cuneus fulvous or reddish.

Head: Width 1.04 mm., vertex .46 mm. Rostrum, length 1.09 mm., just attaining middle of sternum, piceous, scarcely paler at joints. Antennae: Segment ii, length 2.31 mm., cylindrical, not equal to thickness of segment i.

Legs: Black, basal half of hind and middle femora, anterior face of front femora except apically, and two basal segments of tarsi, yellow.

Female: Length 5 mm., width 2.57 mm.; embolar margins strongly arcuate; shorter, more ovate and robust than the male; coloration similar to the male except the coxae; coxae always yellowish except for spot at base.

Uhler's description of the legs was undoubtedly drawn from a female specimen since the leg colors are distinctive of the sex in this species. A specimen in the U. S. N. M. collection has been labeled type, but that particular specimen could scarcely have served for the original description since it does not agree with the original in some essential characters. Uhler's statement "and sometimes the costal margin red or yellow" does not apply to *venaticus*, and the statement by itself implies that the type would not have the embolium yellow. In referring to the form with yellow embolium the author probably had in mind one of the eastern species herein described as *punctipes* or *fulvipes*. Of about 200 specimens of *venaticus* which the writer has examined, the embolium is never yellowish except narrowly at extreme apex.

Breeds on *Solidago altissima*.

Cheshire, 23 June, 1919 (M. P. Z.); Colebrook, 20 July, 1905 (W. E. B.); Green's Farms, 24 June, 1904 (W. E. B.); Litchfield, 22 July, 1920 (P. G.); West Haven, 27 June, 1904 (H. L. V.).

P. venustus Knight, new species.

Male: Length 5.2 mm., width 2.3 mm. Head: Width 1.01 mm., vertex .38 mm.; black, a yellow spot each side of vertex bordering eye, lower margin of jugum and upper margin of lorum, red; clothed with sericeous pale pubescence. Rostrum, length 1.14 mm., scarcely exceeding posterior margins of front coxae, piceous, paler at joints.

Antennae: Segment i, length .81 mm., black, unusually long and thickened (.157 mm. thick); ii, 2.06 mm., cylindrical, thickness .07 mm., yellowish, apical one-third black, pubescence taking color of surface beneath; iii, 1.02 mm., slender, yellowish to fuscous, darker apically; iv, 1.03 mm., blackish.

Pronotum: Length 1.03 mm., width 1.74 mm.; surface minutely granulate and transversely wrinkled; clothed with yellowish to golden, sericeous pubescence; black, lower pleural margin slenderly reddish. Scutellum black, surface and pubescence as on

pronotal disk. Sternum and pleura black; ostiolar peritreme yellowish to reddish.

Hemelytra: Embolar margins moderately arcuate; black, opaque, surface rather irregularly roughened, somewhat scabriculous; clothed with golden and dusky sericeous pubescence. Membrane uniformly dark fuscous, scarcely paler bordering apex of cuneus, veins yellowish.

Legs: Coxae and basal half of femora deep translucent red, lateral aspect of coxae, but more apically on front pair, becoming fuscous; apical one-half to one-third of femora black, a blackish cloud forming on anterior face of front pair near base; tibiae yellowish to fulvous, basal one-third and the apices black; tarsi yellowish, apical half of third segment fuscous. Venter black, clothed with sericeous silvery pubescence, and on genital segment with simple yellowish dusky hairs.

Female: Length 5.7 mm., width 2.6 mm.; embolar margins more strongly arcuate apically; more robust than the male but very similar in coloration; antennal segment i equally thick as that of the male but segment ii slightly more slender.

Holotype: Male, 3 July, 1919, Warren Woods, Berrien County, Mich. (R. F. Hussey); author's collection. Allotype: taken with type. Paratypes: FLORIDA—Females (2), 23 Mar., 1921, Dunedin (W. S. Blatchley). MICHIGAN—Male and female, 26 June, male and females (3), 27 June, male, 3 July, type locality; males (3) and females (2), 30 June, 1919, male, 5 July, 1920, New Buffalo, Berrien County (R. F. Hussey). NORTH CAROLINA—Male, 21 June, Fayetteville (C. S. Brimley). VIRGINIA—Male, July, 1908, Hampton.

***Polymerus gerhardi* Knight, new species.**

Female: Length 6.4 mm., width 2.8 mm. Head: Width 1.16 mm., vertex .51 mm.; black, vertex pale at each side; clothed with sericeous white pubescence. Rostrum, length 1.08 mm., not attaining hind margins of front coxae, piceous, basal segment and joints reddish.

Antennae: Segment i, length .64 mm., thickness .143 mm., black; ii, 2.03 mm., thickness .086 mm., cylindrical, black, rather closely blackish pubescent; iii, .96 mm., fusco-brownish; iv, .88 mm., fuscous.

Pronotum: Length 1.24 mm., width at base 2.14 mm.; black, scarcely shining, rather irregularly rugulose; thickly clothed with sericeous white pubescence; margins of xyphus, and narrow lower margins of pleura, yellowish. Scutellum black, pubescent as on pronotal disk. Sternum and pleura black; ostiolar peritreme yellowish.

Hemelytra: Embolar margins moderately arcuate; black, opaque, thickly clothed with sericeous white pubescence intermixed with more erect, simple black pubescent hairs. Membrane and veins uniformly dark brownish black, scarcely paler bordering apex of cuneus.

Legs: Coxae and femora deep red, coxae more yellowish or orange; tips of femora, tibiae, and tarsi, black; tibiae unusually thick for the genus, spines and pubescence also black. Venter black, thickly clothed with sericeous white pubescence and intermixed with more erect, dark pubescent hairs.

Holotype: Female, 1 July, 1911, Hessville, Ind. (W. J. Gerhard); author's collection. Paratypes: Females (5), collected "at light" with the type. Among material from the U. S. National Museum the writer finds a specimen, male, 15 April, 1906, Cotulla, Texas (F. C. Pratt), that apparently belongs to this species although it is much smaller than the females from Indiana.

The writer takes pleasure in naming this large and beautiful species after the collector, Mr. W. J. Gerhard.

Poecilocapsus Reuter.

P. lineatus (Fabricius). Four-lined leaf bug. (Plate xvi, 18.)

Lygaeus lineatus Fabricius, Ent. Syst. Suppl., 541, 1798,

Cornell Univ. Agr. Expt. Sta., Bull. 58, 1893.

Length 7-7.5 mm., width 3.5 mm.; greenish yellow with four black lines on the dorsum; certain specimens have the yellow of the hemelytra replaced with bright green.

Breeds on a large number of herbaceous plants, but especially on *Rumex*; occasionally becomes a pest on currant bushes.

Bantam, 19 June, 1914 (W. E. B.); Branford, 23 June, 1905 (H. L. V.); 29 June, 1905 (H. W. W.); New Haven, 12 June, 1896 (W. E. B.); 14 June, 1905 (B. H. W.); Stonington, 5 July, 1906 (J. A. H.).

Horcias Distant.

Key to color varieties of *dislocatus* Say.

- | | |
|---|------------------------------------|
| 1. Color red and black | 2 |
| Color black with pale, or entirely black | 7 |
| 2. Pronotum more or less black | 3 |
| Pronotum uniformly red | 4 |
| 3. Pronotal disk bivittate with black on basal half typical | dislocatus |
| Pronotal disk black on basal half but not vittate .. variety | goniphorus |
| 4. Hemelytra red or only slightly infuscated | 5 |
| Hemelytra broadly black, or entirely black | 6 |
| 5. Scutellum black | variety coccineus |
| Scutellum red as well as the whole dorsum variety | rubellus n. var. |
| 6. Hemelytra uniformly black | variety residuus |
| Hemelytra with lateral margins red | variety gradus n. var. |
| 7. (1) Pronotum more or less pale | 8 |
| Pronotum uniformly black | 12 |
| 8. Scutellum uniformly black | 9 |
| Scutellum with median line pale | 10 |
| 9. Hemelytra with lateral margins broadly pale, claval suture never pale | variety limbatellus |
| Hemelytra with lateral margins slenderly pale, claval suture bordered each side with pale | variety scutatus n. var. |
| 10. Clavus with pale | 11 |
| Clavus uniformly black | variety nigriclavus n. var. |

11. Corium black bordering claval suturevariety **affinis**
Corium pale bordering claval suturevariety **flavidus** n. var.
12. (7) Hemelytra uniformly black, or only slenderly pale at base of
radius 13
Costal margin and frequently base of radius, pale ..variety **marginalis**
13. Legs pale testaceous, or blackish only at base of femora
variety **pallipes**
Femora black, or only the apices pale, tibiae chiefly testaceous
variety **nigritus**

H. dislocatus (Say) typical. (Plate xvi, 19.)

Capsus dislocatus Say, Heter. N. Harm., 21, 1832; Compl. Writ., i, 339, 1859.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Length 6.2 mm., width 3 mm.; pale rufo-sanguineus; antennal segments i and ii, tylus, juga, base of vertex, two wedged-shaped approximate spots on basal half of pronotal disk, scutellum excepting median line, inner half of clavus, inner apical angles of corium, membrane, pleura, coxae excluding the anterior pair, and venter, black.

Food plants: *Smilacina racemosa*, *Geranium maculatum*, *Scrophularia leporella*, and occasionally *Caulophyllum thalictroides*. The different color varieties may occur on any of these food plants.

Branford, 3 July, 1905 (H. W. W.); Cornwall, 1 July (B. H. W.); New Haven, 1 June, 1911 (B. H. W.); 6 July, 1904 (H. L. V.); Wallingford, July, 1911 (D. J. C.).

H. dislocatus var. **coccineus** (Emmons).

Phytocoris coccineus Emmons, Nat. Hist. N. Y., Agr., v, pl. 30, fig. 2, 1854.

Bull. Buff. Soc. Nat. Sci. x, 484, 1912.

Similar to *dislocatus* except that the pronotum and hemelytra are nearly or quite immaculate, the scutellum entirely black.

Branford, 29 June, 1905, 5 July, 1905 (H. W. W.).

H. dislocatus var. **rubellus** Knight, new variety.

Similar to *coccineus* but the scutellum as well as the whole dorsum, uniformly bright red.

Holotype: Male, 18 June, 1919, University Farm, St. Paul, Minn. (H. H. Knight). Paratypes: Males and females (6), topotypic. Female, 8 July, 1914, Lake Itasca, Minn. (S. A. Graham).

H. dislocatus var. **goniphorus** (Say).

Capsus goniphorus Say, Heter. N. Harm., 21, 1832: Compl. Writ., i, 341, 1859.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Similar to *dislocatus* except the black on pronotum not divided: uniformly black on scutellum, clavus, and corium; femora and front coxae black.

Branford, 13 July, 1919 (B. H. W.); 28 July, 1905 (H. L. V.); Killingworth, 27 June, 1920 (W. E. B.); New Haven, 1 June, 1911 (B. H. W.); Norwalk, 24 June, 1920 (W. E. B.).

H. dislocatus var. **gradus** Knight, new variety.

Similar to variety *goniphorus* except that the pronotum is uniformly red and the hemelytra more broadly black.

Holotype: Male, 19 June, 1919, University Farm, St. Paul, Minn. (H. H. Knight). Paratypes: Males (3), topotypic.

H. dislocatus var. **residuus** Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Hemelytra and scutellum black, pronotum uniformly red.

Indiana, Minnesota, Ohio.

H. dislocatus var. **limbatellus** (Walker).

Cat. Heterop., vi, 93, 1873.

Similar to variety *goniphorus* except that the red is replaced by yellow or pale.

Branford, 5 July, 1905 (H. W. W.); New Haven, 1 June, 1911 (B. H. W.).

H. dislocatus var. **affinis** (Reuter).

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 74, 1876.

Similar to typical *dislocatus* but the red color replaced by fulvo-testaceous, hemelytra more broadly black; claval vein and spreading to margin, along radius, narrow costal margin, and cuneus except apex, fulvo-testaceous; corium never pale bordering claval suture.

Kent, 27 June, 1920 (K. F. C.); New Haven, 18 June, 1918 (M. P. Z.); Norwalk, 24 June, 1920 (W. E. B.); Wilton, 24 June, 1920 (M. P. Z.).

***H. dislocatus** var. **flavidus** Knight, new variety.

Similar to variety *affinis* but more broadly pale; corium broadly pale bordering clavus.

Holotype: Male, 4 July, 1916, Four Mile, N. Y. (H. H. Knight). Paratypes: Males and females (7), topotypic. CONNECTICUT—Male, 24 June, Wilton (M. P. Zappe). Male, 24 June, Norwalk (W. E. Britton). Female, 27 June, Kent (K. F. Chamberlain). NEW YORK—Female, 12 July, Batavia; Female, 21 June, males (2), 27 June, 1914, Portageville (H. H. Knight).

H. dislocatus var. **scutatus** Knight, new variety.

Similar to variety *flavidus* but with black color on disk of pronotum undivided and the scutellum uniformly black.

Holotype: Female, 4 July, 1916, Four Mile, N. Y. (H. H. Knight).

H. dislocatus var. **nigriclavus** Knight, new variety.

Similar to variety *affinis* but with clavus uniformly black, radius pale on basal half; black color on pronotal disk scarcely divided at basal margin by median pale vitta.

Holotype: Male, 5 July, 1915, Four Mile, N. Y. (H. H. Knight). Paratypes: Males (9) and females (7), topotypic. Female, 18 June, 1914, Batavia; males (3), 14 June, 1914, Ithaca; female, 22 June, 1916, male, 27 June, 1915, Portageville (H. H. Knight).

H. dislocatus var. **marginalis** (Reuter).

Poecilopsus marginalis Reuter, Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 75, 1876.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Black, slender costal margin and usually line on base of radius, white; both vertex and the tibiae more or less pale.

New York.

H. dislocatus var. **pallipes** Van Duzee.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Black, legs pale testaceous, or blackish only at base of femora.

South Meriden, June (H. L. J.).

H. dislocatus var. **nigritus** Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 41, 1909.

Bull. Buff. Soc. Nat. Sci., x, 484, 1912.

Black, apices of femora, and tibiae chiefly, testaceous; sometimes with vertex and slender line on base of radius pale.

Branford, 13 June, 1919 (B. H. W.); Cornwall, 3 July, 1920 (K. F. C.); Darien, June; New Haven, 6 July (H. L. V.); South Meriden, July; Winnipauk, June.

Adelphocoris Reuter.

A. rapidus (Say). (Plate xvi, 21.)

Compl. Writ., i, 339, 1859.

Length 7 mm., width 2.8 mm.; dark brown, hemelytra with costal margins pale; pronotum yellowish brown and with two black spots.

Common species; breeds on *Rumex* in the northern states.

Branford, 19 Sept., 1904 (H. W. W.); Chapinville, 27 Aug., 1904 (W. E. B.); East Hartford, 2 Aug., 1905 (B. H. W.); Hamden, 14 July, 1911 (W. E. B.); New Haven, 24 June, 1902 (E. J. S. M.), 19 July, 1905, 29 Sept., 1902 (B. H. W.); Scotland, 27 July, 1904 (B. H. W.); Stafford, 24 Aug., 1905 (W. E. B.); Torrington, 7 July, 1905 (W. E. B.); West Haven, 27 June, 1905 (H. L. V.); Yalesville, 19 Oct., 1903 (H. L. V.).

Calocoris Fieber.

C. norvegicus (Gmelin).

Cimex norvegicus Gmelin, in Linnaeus, Syst. Nat., Edn. 13, i, pt. 4, 2176, 1788.

Reuter, Hem. Gymn. Eur., v, 204, 377, pl. 7, fig. 4, 1896.

Length 6.7 mm., width 2.6 mm.; yellowish green, with two small black spots on pronotum, one behind each callus; clothed with black and golden yellow pubescence intermixed.

Occurs on grasses.

Greenwich, 24 June, 1921 (W. E. B.); Stratford, 9 July, 1920 (B. H. W.).

Paracalocoris Distant.

Key to Species.

1. Hind tibiae thickly clothed with long erect hairs which obscure or become confused with the tibial spines **scrupeus**
Hind tibiae with hairs shorter and more appressed, especially on inner side, hairs not easily confused with the true spines 2

2. Antennal segment i as long as, or longer than pronotum 3
 Antennal segment i shorter than length of pronotum 4
3. Basal width of pronotum exceeding 2mm.; color everywhere except discal spots and membrane, a lighter or darker reddish brown **adustus**
 Basal width of pronotum less than 2mm.; coloration chiefly fusco-piceous, frequently pale on costal margin **hawleyi**
4. Antennal segment ii not exceeding 2.2mm., in length 5
 Antennal segment ii at least 2.4mm. in length, usually longer; segment i nearly equaling length of pronotum; basal width of pronotum at least 2.2mm., usually greater **limbus**
5. Color above pale brown, mottled with several large and numerous minute yellow spots, largest spots at middle and apex of corium, the apical half of scutellum yellow; legs and antennal segment i with brown and yellow variegated, segment ii with apical one-third black **multisignatus**
 Otherwise colored 6
6. Color dull tawny red, variegated with yellow; indistinctly striped with yellow on pronotum, scutellum, and hemelytra; form short and broad **heidemanni**
 Color stramineous to dark brownish gray, or dark brown, variegated with paler maculae; antennal segment ii with narrow annulus at base and the apical one-third blackish, basal half yellowish brown but paler at each extremity bordering the black color **colon**

*Key to color varieties of **scrupus** Say.**

1. Hemelytra with costal margin colored similarly to disk of corium 2
 Hemelytra with costal margin, or at least the cuneus, distinctly paler in color than disk of corium 9
2. Pronotum with dark markings in addition to the discal spots 3
 Pronotum without definite dark markings in addition to discal spots 8
3. Pronotal disk and scutellum orange to pale red, anterior to discal spots dusky to piceous, basal angles of disk usually with piceous dots or more or less clouded 4
 Pronotal disk otherwise marked 5
4. Corium fusco-piceous **typical scrupus**
 Corium dark red, cuneus somewhat lighter **variety rubidus**
5. Pronotum very dark 6
 Pronotum pale except for indistinct vittae and dusky maculations from discal spots to posterior margin, and between these and lateral margins; a broad pale vitta traversing scutellum, thorax, and top of head; corium yellowish brown **variety percursus**
6. Scutellum dark 7
 Scutellum chiefly yellowish or reddish; pronotal disk dark above except for a median and two lateral areas in line with the discal spots **variety triops**
7. Scutellum piceous; pronotal disk with two lateral yellow areas .. **variety diops**
 Scutellum dusky with median pale vitta, spots on clavus and corium yellowish red **variety delta**
8. (2) Corium reddish brown with yellowish dots **variety compar**
 Corium except apex, clavus except base and slender inner margin, uniformly orange-red **variety ardens**

* This key is largely an adaptation from the work of Mr. W. L. McAtee (Ann. Ent. Soc. Am., ix, 369, 1916) although specimens of each variety are at hand for study.

9. (1) Cuneus and sometimes spots on corium lighter in color than disk 10
 Cuneus and costal margin entirely reddish or yellowish 13
10. Pronotal disk orange to pale red, anterior to discal spots dusky or even piceous, basal angles of disk clouded or with piceous dots
 variety **cunealis** 11
 Pronotal disk otherwise marked 11
11. Pronotal disk dark or dusky, with paler vittae laterad of discal spots and extending distad, also a light median patch which frequently extends to near basal margin 12
 Pronotal disk except discal spots and the anterior one-third, scutellum, cuneus, and hemelytral maculations, pale yellow
 variety **lucidus** 12
12. Scutellum dark, with distinct median light vitta variety **par**
 Scutellum sordid or clouded yellow variety **sordidus** 13
13. (9) Pronotum without dark markings between discal spots and basal margin 14
 Pronotum with dark markings between discal spots and basal margin 15
14. Hemelytra with bootjack-shaped dark area, embolar margins, scutellum, and basal half of pronotum, yellowish or reddish
 variety **bidens** 15
 Hemelytra with bootjack-shaped mark obsolete, dorsal surface except base and inner apical angle of corium, and slender inner margin of clavus, reddish or yellowish variety **ardens** 16
15. Pronotal disk with anterior one-third darkened 16
 Pronotal disk with anterior one-third yellowish or reddish
 variety **bicolor** 17
16. Scutellum dusky, median line paler 17
 Scutellum chiefly yellowish, median pale vitta bounded each side by a more or less complete wedge-shaped dark mark; corium and clavus spotted with yellow variety **varius** 17
17. Clavus and adjacent parts of corium dusky variety **nubilus**
 Clavus and adjacent parts of corium spotted with yellowish red ...
 variety **delta** 17

P. scrupeus (Say), variety typical.

Capsus scrupeus Say, Heter. N. Harm., 23, 1832; Compl. Writ., i, 342, 1859.

Ann. Ent. Soc. Am., ix, 370, 1916.

Length 6.5 mm., width 2.6 mm., length of pronotum 1.33 mm.
 Antennae: Segment i, length 1.47 mm.; ii, 2.36 mm.; iii, .91 mm.; iv, .97 mm.

This species is remarkable for the large number of color varieties it exhibits.

Breeds most frequently on wild grapevine (*Vitis* sps.), but occurs on cultivated varieties.

New Haven, 27 June, 1909 (W. E. B.); Wallingford, 14 June, 1911 (J. K. L.).

P. scrupeus var. **bidens** McAtee.

Ann. Ent. Soc. Am., ix, 374, 1916.

This variety is well distinguished in the key.

South Meriden, July (H. L. J.).

P. adustus McAtee.

Ann. Ent. Soc. Am., ix, 377, 1916.

Length 8 mm., width 3 mm. Antennae: Segment i, 1.6 mm.; ii, 2.53 mm.; iii, 1.16 mm.; iv, 1.1 mm. Color almost uniform reddish brown, a little paler on cuneus and lower surface; inclining to fuscous on antennae, tibiae, and inner margins of clavus and corium; dorsum clothed with rather abundant short pale yellow hairs.

New Jersey.

Key to color varieties of hawleyi Knight.

1. Hemelytra with costal margins pale or yellowish 2
Hemelytra without pale costal margins 3
2. Costal stripe undivided, though it may contain a dark blotch at middle of costal margin typical **hawleyi**
Costal stripe divided by a dark vitta which is broader posteriorly, leaving a very narrow pale costal margin variety **fissus**
3. Hemelytra except cuneus almost uniform fusco-piceous, although radius and costa may be pale variety **ancora**
Hemelytra and other parts of dorsum more or less spotted with yellow variety **pallidulus**

P. hawleyi Knight, variety typical.

Ann. Ent. Soc. Am., ix, 377, 1916.

Length 6.3 mm., width 2.4 mm. Antennae: Segment i, length 1.38 mm.; ii, 2.27 mm.; iii, 1 mm.; iv, .61 mm. Length of pronotum 1.22 mm. Color fusco-piceous to piceous, costal margins of hemelytra pale to yellowish, cuneus reddish; clothed with very fine pale and fuscous pubescence.

Breeds on cultivated hop in New York.

Massachusetts, New York.

P. hawleyi var. **ancora** Knight.

Ann. Ent. Soc. Am., ix, 378, 1916.

Occurs with the typical variety.

Massachusetts, New York.

P. hawleyi var. **fissus** McAtee.

Ann. Ent. Soc. Am., ix, 379, 1916.

Massachusetts, New York.

P. hawleyi var. **pallidulus** McAtee.

Ann. Ent. Soc. Am., ix, 380, 1916.

Breeds on apple in New York.

P. limbus McAtee.

Ann. Ent. Soc. Am., ix, 380, 1916.

Length 7.5 mm., width 3 mm.; length of pronotum 1.52 mm. Antennae: Segment i, length 1.55 mm.; ii, 2.7 mm.; iii, 1.16 mm.; iv, 1.25 mm. Fuscous to blackish, head except tylus and clouding on frons, pronotum except on basal half behind discal spots, embolium and margin of corium, and cuneus, yellowish to reddish.

Massachusetts, Georgia.

Key to varieties of colon Say.

1. Antennal segment ii with narrow pale annulus next to blackish base, brownish beyond but paler again at middle; hemelytra pale to grayish and with darker brown spots, or with background chiefly brownish and spotted with pale yellowishtypical **colon**
Antennal segment ii pale or brownish on basal half but without a distinctly paler annulus next to the blackish base 2
2. Hemelytra practically unicolorous pale to stramineous ..variety **castus**
Hemelytra uniformly dark reddish brown to fusco-piceous, or with markings lighter than ground color 3
3. Hemelytra always more or less spotted with yellow, and usually the pronotum; pronotum varying from reddish to fuscous, frequently vittatevariety **colonus**
Hemelytra without yellow spots, cuneus reddish and sometimes spottedvariety **amiculus**

P. colon (Say).

Compl. Writ., i, 346, 1859.

Length 5.8 mm., width 2.5 mm.; length of pronotum 1.33 mm. Antennae: Segment i, length 1.1 mm., brownish, spotted with yellow, the spots more or less confluent, clothed with blackish semi-erect hairs, in length scarcely equaling thickness of segment; ii, 2.22 mm., narrow base and the apical one-third black, brownish between but with pale annulus bordering the black, finely pubescent; iii, .97 mm., pale to fuscous, becoming darker at apex; iv, 1.08 mm., pale fuscous, darker at apex.

Dorsum pale yellowish to grayish or dark brown, spotted with yellow, in paler specimens the brown forming large spots, clothed with pale yellowish to golden pubescence; membrane fuscous, paler at middle and a spot each side just beyond tip of cuneus. Ventral surface brownish, each segment of venter with two or three longitudinal yellow marks on the sides.

Legs yellowish, apical one-third of femora and two bands on tibiae brownish, the brown color spotted with yellow; in dark specimens the hind femora developing a brownish patch on basal half.

New Jersey, New York.

P. colon var. **colonus** McAtee.

Ann. Ent. Soc. Am., ix, 383, 1916.

Length 5-6 mm., width 2.1-2.7 mm.; reddish brown to fusco-piceous, dorsum more or less spotted with yellow; variable in size and color but readily distinguished in the key.

Food plant: Virginia creeper (*Psedera quinquefolia*).

New Jersey, New York, Massachusetts, Vermont.

Stenotus Jakovlev.**S. binotatus** (Fabricius). (Plate xvi, 20.)

Lygaeus binotatus Fabricius, Ent. Syst., iv, 172, 1794.

Reuter, Hem. Gymn. Eur., v, 123, pl. 5, fig. 5, 1896.

Male: Length 6 mm., width 2 mm.; chiefly yellowish green below, pronotum with two broad black rays; hemelytra yellowish orange, with two broad, irregular, longitudinal blackish stripes.

Female: Length 7 mm., width 2.4 mm.; yellowish green, pronotum with two prominent black spots on disk, one behind each callus; corium with longitudinal fuscous stripe.

Breeds on *Dactylus glomerata*, and probably to some extent on other grasses.

Branford, 13 June, 1918 (B. H. W.); New Haven, 16 June, 25 June, 2 July, 1920 (B. H. W.); Stamford, 24 June, 1920 (W. E. B.).

Garganus Stål.

G. fusiformis (Say).

Compl. Writ., i, 344, 1859.

Length 3.8-4 mm., width 1.5 mm.; black, embolium, outer margin of cuneus, and narrowly along commissure, pale; legs, antennal segment i, and sometimes the venter, reddish yellow.

Breeds on *Tussilago farfara*, and occurs on other herbaceous plants found growing in damp situations.

Branford, 29 July, 1905 (H. W. W.); Cornwall, 10 Aug., 1918 (B. H. W.).

Neurocolpus Reuter.

N. nubilus (Say).

Compl. Writ., i, 341, 1859.

Length 5.7-6.8 mm., width 2 mm.; exceedingly variable in coloration; usually light yellowish brown to reddish brown or black.

Food plants: *Cephalanthus occidentalis*, *Rhus* sp., and probably others.

Cornwall, 10 Aug., 1919 (B. H. W.); Hamden, 24 July, 1910 (B. H. W.); 9 Aug., 1920 (M. P. Z.); New Haven, 6 July, 1904 (H. L. V.); 13 July, 1904 (W. E. B.); 16 Aug., 1904 (B. H. W.).

Phytocoris Fallen.

Key to Groups of Phytocoris.

1. Wing membrane conspurcate, or irrorate with pale; median lobe of male genital structure provided with a flagellum, without (*juncus* excepted) or rarely bearing distinct teeth (p. 616) Group I
- Wing membrane either marbled, uniformly fuscous, or nearly pale, never distinctly conspurcate (except perhaps in well marked forms of *quercicola*), sometimes with margins of fuscous areas separating into small specks but more marbled than conspurcate; median lobe of male genital structure with a flagellum bearing distinct teeth 2
2. Antennal segment i, in length, distinctly greater than width of head 3
- Antennal segment i, in length, not equal to width of head (p. 641) Group III
3. Antennae more blackish or fuscous than pale, if segment ii broadly

pale on middle, then the dorsum chiefly fuscous to blackish; general coloration fuscous or blackish on a paler background

(p. 631) Group II

Antennae more nearly pale, yellowish, or reddish than blackish, segment ii sometimes fuscous at apex and near base but more pale than fuscous (in *tibialis* with a slender fuscous line on anterior face); general coloration usually yellowish to reddish over a paler background (p. 644) Group IV

Key to Species of Group I.

1. Antennal segment i greatly thickened, cylindrical, thickness nearly equal to dorsal width of an eye 2
 Antennal segment i more slender, thickness distinctly less than dorsal width of an eye 4
2. Antennal segment ii uniformly yellowish, scarcely dusky at apex 3
 Antennal segment ii yellowish, blackish on apical one-fourth (p. 617) *lasiomerus*
3. Antennal segment i with two distinct types of hairs, set with erect black bristle-like hairs and between with shorter, more recumbent, sparsely set black hairs; scutellum with reddish each side of median line, clothed with sericeous white pubescence (p. 618) *pallidicornis*
 Antennal segment i with shortest of black hairs so long as to be easily confused with the erect bristle-like hairs; scutellum uniformly yellowish, sparsely clothed only with simple erect pubescent hairs (p. 619) *rubropictus* n. sp.
4. (1) Antennal segment ii chiefly blackish, usually annulated with pale 5
 Antennal segment ii uniformly yellowish, frequently somewhat dusky at apex and near base; dorsum chiefly reddish on a pale yellowish background (p. 620) *ulmi*
5. Antennal segment ii black at base, with a pale annulus somewhat removed from base 6
 Antennal segment ii with pale annulus at base; blackish beyond ... 7
6. Antennal segment i, in length, equal to length of head and pronotum taken together, also greater than width of pronotum at base; basal submargin of pronotal disk with four black callous spots, two each side of median line (p. 624) *antennalis*
 Antennal segment i, in length, only equal to length of pronotum plus one-third length of head, likewise not equal to width of pronotum at base (p. 621) *palmeri*
7. (5) Antennal segment iii with pale annulus at base and at middle 8
 Antennal segment iii with pale annulus only at base, sometimes obsolete 9
8. Dorsum bearing both black and white scale-like hairs, turned on edge; propleura pale on lower half but without distinct white line above middle of coxal cleft; lower half of face with some fuscous (p. 626) *conspurcatus*
 Dorsum without distinct scale-like hairs; propleura white, black along dorsal margin, with a clear-cut black line across lower half of coxal cleft and extending to basal margin; lower half of face white (p. 624) *davisi* n. sp.
9. Antennal segment ii black, a pale band at base but at most only narrowly pale on middle 10
 Antennal segment ii broadly pale yellowish to dusky on middle, dark fuscous only at apex and next to pale band at base; small slender species, length 5.1 mm. (p. 622) *minutulus*
10. Antennal segment iii pale at base 11

- Antennal segment iii uniformly brownish black; pronotal disk with base and lateral margins black although extreme basal edge slenderly pale, central area yellowish green but sometimes with slender median vitta indicated in black; calli black, or in pale forms indicated with black lines; tibiae brownish black, indistinct pale spots apparent; length 8.5 mm (p. 621) *junceus* n. sp.
11. Lower half of head blackish, without clearly marked white areas; male genital segment and claspers distinctive (fig. 149: 6) (p. 629) *corticeviventis*
- Lower half of head chiefly white, sometimes with black bar across middle of tylus, dorsal margins of juga and lora dark reddish black but the white areas never obscured 12
12. Corium without distinct longitudinal black vitta on a grayish background 13
- Corium with longitudinal black vitta along middle of apical half, set on a grayish background, radius indicated by an interrupted series of black spots; antennal segment i, in length, equal to distance between tylus and basal margin of pronotum, segment ii pale at base but interrupted beneath with blackish line (p. 627) *vittatus*
13. Antennal segment ii with the pale band situated at slightly beyond middle; tylus with distinct black band across middle, its lower margin just in line with dorsal margins of lora; male genital segment without tubercle at base of left clasper.. (p. 630) *dimidiatus*
- Antennal segment ii with pale band at middle; tylus without heavy black band across middle although frequently with an incomplete dark reddish spot at about that point 14
14. Pronotum strongly sulcate at sides and immediately behind calli; apical half of hind femora with three or four large pale marks, somewhat confluent on posterior aspect (p. 626) *sulcatus*
- Pronotum not distinctly sulcate at sides or behind calli; hind femora chiefly black, with not more than one prominent white band on apical half 15
15. Hind femora brownish black, apical half with small pale dots only; pale band at middle of antennal segment ii nearly obsolete (p. 629) *fumatus*
- Hind femora black, with a distinct white oblique band just before apex; pale band at middle of antennal segment ii very distinct (p. 628) *tuberculatus*

P. lasiomerus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 34, 1909.

Male: Length 7.6 mm., width 2 mm. Head: Width 1.03 mm., vertex .47 mm., length .86 mm.; only very slightly inclined, eyes somewhat removed from pronotal collar, tylus prominent, clothed with prominent yellowish pubescence; reddish upon a yellowish background, median line of front yellowish, transversely marked with red at each side; collum reddish, median line and a mark at each side behind dorsal margin of eye, red. Rostrum, length 3.2 mm., reaching to hind margin of fourth abdominal segment, yellowish, blackish at apex.

Antennae: Segment i, length 1.66 mm., thickness .17 mm., yellowish, irregularly marked with red, apex reddish, clothed with half erect black hairs and interspersed with more erect bristle-like hairs which in length equal or slightly exceed thickness of seg-

ment; ii, 3.1 mm., uniformly slender, yellowish, apical one-fourth blackish, finely yellowish pubescent except on blackish apex; iii, 2.15 mm., yellowish, dusky at apex; iv, 1.54 mm., pale fuscous.

Pronotum: Length 1.07 mm., width at base 1.69 mm.; collar rather broad and flattened; lateral margins distinctly sulcate, coxal cleft visible from dorsal aspect; fusco-brownish and tinged with reddish, central area of disk paler, more nearly fuscous laterally; lower pleural margin and lateral margins of xyphus, slenderly yellowish; disk clothed with short erect black hairs and intermixed with pale sericeous pubescence, collar beset with prominent black hairs. Scutellum fusco-brownish, paler at apex and basal angles, clothed with pale sericeous pubescence and intermixed with a few short dark hairs. Sternum yellowish to brownish red, pleura reddish, margins of sclerites paler; ostiolar peritreme pale, reddish to fuscous above ostiole.

Hemelytra: Elongate, embolar margins only very slightly arcuate; fusco-brownish upon a yellowish background, paler on embolus and irregularly so on outer margin of corium, clavus sometimes nearly fuscous; clothed with pale sericeous pubescence and intermixed with more erect short blackish hairs; cuneus yellowish translucent, apex reddish to blackish, inner half irregularly marked with reddish. Membrane irregularly conspurcate with fuscous, spotting less distinct on apical one-third and becoming clouded with fusco-brownish, veins reddish.

Legs: Yellowish, femora except base irregularly marked with dark reddish, the pale color appearing as irrorations, front and middle femora more nearly pale, ventral aspect transversely marked with fusco-reddish although somewhat irregularly; front tibiae infuscated at apex, hind pair irregularly marked with fusco-reddish on basal one-fourth; tarsi fuscous at apex.

Venter: Reddish to fusco-brownish, clothed with pale pubescence; genital segment with slight tubercle just above base of left clasper, claspers distinctive.

Female: Length 8 mm., width 2.5 mm.; very similar to the male but slightly more robust, hemelytra more reddish than fuscous.

Occurs on mixed herbaceous growth; probably phytophagous. Litchfield, 22 July, 1920 (P. G.).

P. pallidicornis Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 69, 1876.

Very similar to *lasiomerus* but distinguished by the uniformly yellowish antennal segment ii, and dorsum more thickly clothed with pale sericeous pubescence; hemelytra irregularly conspurcate with brownish, clavus never distinctly fuscous.

Male: Length 6.4 mm., width 2.06 mm. Head: Width 1.03 mm., vertex .37 mm. Antennae: Segment i, length 1.4 mm., thickness .18 mm., beset with erect black bristle-like hairs, and between with shorter, more recumbent, sparsely set black hairs; ii, 2.85 mm., uniformly yellowish, finely pale pubescent; iii, 1.83 mm., yellowish, becoming pale fuscous on apical half; iv, 1.38 mm., fuscous.

Pronotum: Length .97 mm., width at base 1.6 mm. Genital segment with less prominent tubercle above base of left clasper than in *lasiomerus*.

Female: Length 6.8 mm., width 2.4 mm.; slightly more robust than the male but very similar in coloration.

Occurs on mixed herbaceous growth; probably phytophagous. Massachusetts, New Hampshire, New York.

***Phytocoris rubropictus* Knight, new species.**

Female: Length 7.4 mm., width 2.5 mm. Head: Width 1.08 mm., vertex .51 mm.; very similar to *lasiomerus* but with brighter red. Rostrum, length 3.57 mm., yellowish to reddish, blackish on apex.

Antennae: Segment i, length 1.8 mm., thickness .26 mm., nearly equal to dorsal thickness of an eye, yellowish and irregularly marked with reddish, more uniformly reddish near apex, clothed with nearly erect black hairs and intermixed with bristle-like hairs which are easily confused with the former; ii, 3.2 mm., slender, pale, becoming brownish at apex and narrowly reddish at base, pale pubescent; iii, 2.14 mm., yellowish, dusky apically; iv, 1.67 mm., pale fuscous.

Pronotum: Length 1.11 mm., width at base 1.77 mm.; reddish, calli except outer margins, and a nearly quadrangular area on central portion of disk, yellowish, thus leaving basal margin and broad lateral margins red; lower margin of propleura pale to yellowish, also a somewhat indistinct yellowish ray across top of coxal cleft and extending to posterior margin; disk clothed with rather short blackish hairs, lateral margins and collar set with longer hairs, almost destitute of pale sericeous pubescence. Scutellum and mesoscutum uniformly yellow, rather sparsely clothed with short, pale to yellowish pubescent hairs. Sternum yellowish to reddish, pleura reddish to fuscous; ostiolar peritreme pale to reddish, more reddish above.

Hemelytra: Embolar margins moderately arcuate; dull reddish, irregularly irrorate with yellowish; clavus reddish, claval vein yellowish; corium reddish, inner and outer margins more yellowish than red; embolium yellowish but with more or less reddish developing in hypodermis; yellowish pubescent, rather sparsely set with groups of prostrate, pale sericeous pubescence; cuneus uniformly red, inner angle somewhat yellowish. Membrane pale fumate and conspurcate with fuscous, the spots coalescing apically to form fuscous margin at apex, veins red.

Legs: Yellowish, femora with small irregular reddish spots developing in hypodermis; hind femora with much less reddish than either *lasiomerus* or *pallidicornis*; tarsi fuscous on apices.

Venter: Yellowish to reddish, yellowish pubescent.

Male: Length 8 mm., width 2.5 mm.; similar to the female in coloration but in form more slender. Head: Width 1.11 mm., vertex .48 mm. Antennae: Segment i, length 1.97 mm., thick-

ness .26 mm., coloration and type of hairs similar to that of female; ii, 3.23 mm., slender, uniformly yellowish, narrowly reddish at base and tinged with brownish at apex; iii, 2.31 mm., yellowish; iv, missing. Pronotum, length 1.17 mm., width at base 1.81 mm. Venter: Chiefly reddish, genital segment becoming fuscous on base; tubercle above base of left genital clasper more prominent than that of *lasiomerus*, also a slight tubercle above base of right clasper.

Holotype: Female, 12 Aug., 1920, Wanakena, N. Y. (C. J. Drake); author's collection. Allotype: 15 Aug., 1907, Roque Bluff, Me. (J. A. Cushman).

P. ulmi (Linnaeus).

Cimex ulmi Linnaeus, Syst. Nat., Edn. 10, 449, 1758.

Reuter, Hem. Gymn. Eur., v, 281, pl. ix, fig. 5, 1896.

General aspect very suggestive of *pallidicornis* but distinguished at once by the more slender antennal segment i.

Male: Length 8 mm., width 2.5 mm. Head: Width 1.08 mm., vertex .46 mm.; chiefly reddish, paler on vertex, tylus and just above base fuscous and set with prominent black hairs. Rostrum, length 3.77 mm., attaining base of fifth abdominal segment, yellowish to reddish, apex blackish.

Antennae: Segment i, length 1.54 mm., thickness .114 mm., thicker at apex (.143 mm.), pale, brownish on dorsal aspect but broken into spots by irregular white glabrous areas, brownish pubescent and beset with several dark bristles which in length about equal thickness of segment; ii, 3.26 mm., slender, pale to yellowish, finely pale pubescent; iii, 2 mm., yellowish, scarcely darker apically; iv, 1.36 mm., pale fuscous.

Pronotum: Length 1.28 mm., width at base 2.11 mm.; reddish to dusky, darker on disk bordering the slenderly pale basal margin; clothed with yellowish pubescence and intermixed with short black hairs, anterior margin and collar beset with black bristles. Scutellum pale to yellowish, with reddish spot each side of median line on apical half. Sternum and pleura dark reddish to fuscous; ostiolar peritreme white.

Hemelytra: Embolar margins only very slightly arcuate; yellowish testaceous and darkened with reddish, the red color developing most strongly on apical half of cuneus, along claval veins; line on corium parallel to claval suture, and in spots along embolium; clothed with yellowish pubescence and intermixed with short black hairs. Membrane thickly conspurcate with fuscous, spots confluent on apex, a rather large pale area just beyond apex of cuneus but inclosing a fuscous spot set on margin; veins red.

Legs: Nearly as in *lasiomerus*. Venter dark reddish to fuscous; genital segment without indication of a tubercle above base of left clasper.

Female: Length 7.1 mm., width 2.4 mm.; pubescence and color-

ation very similar to that of male but hemelytra shorter and embolar margins somewhat more strongly arcuate.

A single specimen is at hand, female, 17 Aug., 1914, Yarmouth, NOVA SCOTIA (W. H. Brittain). Comparison has been made with European specimens of *ulmi* Linnaeus which were determined by Reuter.

Recorded in Europe as occurring on *Ulmus*, *Alnus*, *Quercus*, and other plants.

P. palmeri Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 32, 1909.

Male: Length 7 mm., width 1.7 mm. Sordid white-canescens, variegated with fuscous and black; sides of pronotum and thin band before basal margin blackish, disk fuscous to blackish vittate.

Antennae: Segment i linear, slender, variegated with white, equal in length to pronotum plus basal third of head, and but little shorter than basal margin of pronotum; segment ii very narrowly blackish at base, with a narrow white band just short of middle.



FIG. 134. *Phytocoris palmeri* Reuter,—male genital claspers, (a) left clasper, lateral aspect, (b) right clasper, lateral aspect. Greatly enlarged. Drawing by Dr. H. H. Knight.

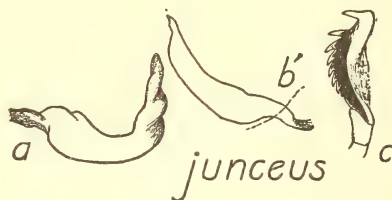


FIG. 135. *Phytocoris junceus* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) right clasper, lateral aspect, with outline of genital segment added, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

Scutellum black, shining, basal angles and apical median line white. Membrane densely hyaline, conspurcate with blackish. Genital claspers distinctive (fig. 134), especially in the form of right clasper.

Described from Quinze Lake, Quebec. The figure of the male genital claspers was drawn from the type in the collection of E. P. Van Duzee.

Phytocoris junceus Knight, new species.

Male: Length 9.2 mm., width 2.7 mm. Head: Width 1.11 mm., vertex .41 mm.; black, shining; collum pale, median line pale but with slender blackish line each side setting it off, also an oblique black line behind dorsal margin of each eye; vertex with slight groove on median line, each side with a prominent alutaceous spot; front beset with prominent brownish black hairs. Rostrum, length 3.6 mm., reaching upon sixth abdominal segment, brownish to piceous, darker apically.

Antennae: Segment i, length 1.21 mm., thickness .11 mm., slightly thicker at apex, fuscous to black, with six or seven small pale spots on dorsal surface, clothed with fine black hairs and interspersed with several erect black bristles on inner and dorsal surface; ii, 3.2 mm., slender, cylindrical, clothed with short blackish pubescent hairs, fuscous to black, becoming black apically; iii, 2 mm., uniformly blackish; iv, 1 mm., uniformly blackish.

Pronotum: Length 1.17 mm., width at base 2.03 mm.; black, moderately shining, pale to yellowish between calli and on central area of disk, thus leaving basal and lateral margins broadly black, but with basal margin slenderly pale; clothed with short erect black hairs, a single prominent black bristle at anterior angles of disk, collar beset with several bristles, paler area of disk also with finer and more recumbent yellowish pubescence; xyphus and lower pleural margins pale to greenish. Scutellum black, slightly shining, strongly convex, clothed with blackish hairs, basal angles whitish; mesoscutum rather broadly exposed, blackish, a yellowish spot near lateral margins. Sternum and pleura black, pleura more strongly shining, lower margin of epimera of mesothorax and the ostiolar peritreme, white.

Hemelytra: Black with pale; clavus largely pale but with margins and claval vein black; corium black, a prominent pale spot on middle, a pale indication near base, and with slender pale streak on apical area bordering radius, also somewhat pale along outer margin of radius at middle and beyond; embolium rather uniformly fusco-blackish; cuneus black, pale to reddish on base; clothed with short black hairs and intermixed with recumbent, somewhat sericeous pale pubescence. Membrane dark fuscous, somewhat paler on middle but conspurcate with coalescing spots of fuscous, a small pale spot bordering apex of cuneus; veins fuscous, brachium pale at apical junction of smaller and larger areole.

Legs: Coxae pale to greenish, becoming fuscous near apices; femora chiefly blackish, marked with small pale spots, hind pair with an irregular incomplete subapical band, more conspicuous on anterior aspect, clothed with black hairs; tibiae pale to brownish black, dark at base and apically, spines and the spots at base black, also with irregular fuscous spots between; tarsi black.

Venter: Brownish black, moderately shining, pale to brownish pubescent; genital claspers distinctive of the species (fig. 135).

Holotype: Male, 24 July, 1915, Mt. Washington, alt. 2500 ft., New Hampshire (C. W. Johnson); author's collection. Paratypes: Male, 23 July, male, 30 July, male, 1 Aug., male, 7 Aug., 1921, Nordegg, ALBERTA (J. McDunnough).

P. minutulus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 24, 1909.

Female: Length 5.1 mm., width 1.7 mm. Head: Width .83 mm., vertex .37 mm.; chiefly fusco-brownish, front clothed

with prominent yellowish pubescence. Rostrum, length 2.66 mm., reaching upon sixth abdominal segment, pale yellowish, blackish at apex.

Antennae: Segment i, length 1.28 mm., thickest near base and most slender just before apex, beset on inner and dorsal surface with several prominent pale spines, reddish to fuscous but with several irregular pale glabrous spots; ii, 2.43 mm., yellowish brown, fuscous at apex and next to the pale annulus at base; iii, 1.6 mm., yellowish to dusky, pale at base and becoming darker apically; iv, 1.47 mm., pale fuscous.

Pronotum: Length .74 mm., width at base 1.36 mm.; testaceous to fuscous, basal margin of disk pale but the submargin with dark fuscous bordering the pale; propleura chiefly pale, with a brownish black ray across lower half of coxal cleft which extends to basal margin; clothed with short black hairs and interspersed between with pale sericeous pubescence. Scutellum testaceous to dusky, with a small fuscous dot each side on margin near apex. Sternum and pleura testaceous to fuscous; ostiolar peritreme pale but becoming fuscous above.

Hemelytra: Embolar margins very slightly arcuate; clavus pale to fuscous, paler bordering scutellum and on claval suture; embolium fuscous but with pale irrorations; corium fuscous, irregularly pale bordering embolium, tinged with brownish on basal half, anal ridge pale; pubescence similar to that of pronotum but the pale sericeous hairs grouped in places to form white spots. Cuneus pale translucent, reddish to black on apex and with black spot at base and middle of membrane margin. Membrane conspurcate with fuscous, a paler spot near apex of cuneus and a second one on margin slightly beyond, veins reddish except that separating areoles.

Legs: Coxae pale, a reddish spot near base of lateral aspect; femora brownish black, chiefly pale on basal one-third and the blackish area irrorate with pale spots, also with a fairly distinct subapical pale band, pale irrorations largest on dorsal aspect but very small beyond the subapical pale band; hind tibiae pale, blackish on basal one-fifth, also with a fuscous band at middle; front tibiae fuscous, with three pale annuli which leave base and apex dark; intermediate tibiae scarcely fuscous at apex, with a narrow fuscous band somewhat before apex, a broader one at middle, and rather broadly fuscous or reddish near base but marked with pale spots; tarsi pale, apices fuscous, basal segment dusky.

Venter: Testaceous to reddish and fuscous, more fuscous on vagina exterior and ventrally on genital segments.

Male: Length 5 mm., width 1.55 mm.; very similar to the female but more slender; genital claspers distinctive.

Allotype: Female, 9 Aug., 1919, Cold Spring Harbor, N. Y. (H. M. Parshley); author's collection.

East River, 8 Aug., 7 Sept., 1910 (C. R. E.).

P. antennalis Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 32, 1909.

Male: Length 5.1 mm., width 1.6 mm. Head: Width .90 mm., vertex .42 mm.; testaceous to brownish black, tylus white, the middle third blackish. Antennae: Segment i, length 1.28 mm., brownish black, inner surface marked with four or five pale spots; ii, 2.56 mm., black, with a narrow pale annulus somewhat removed from base and a second broader band at slightly beyond middle; iii, 1.66 mm., fusco-brownish, pale at base; iv, 1.44 mm., fuscous. Pronotum: Length .79 mm., width at base 1.43 mm., testaceous to brownish, becoming black bordering the sinuately pale basal margin; basal submargin with two callus spots each side of middle; propleura blackish, a pale ray across top of coxal cleft. Scutellum testaceous to fuscous, with a slender nearly obsolete pale median line.

Hemelytra: Testaceous to fuscous, clothed with yellowish, black, and white pubescence; embolium with a callous black spot at apex, also blackish at middle but broken by pale marks; corium darker bordering clavus and on spot at middle along outer margin; cuneus reddish to blackish along outer margin and apex, with a black tuft of hairs at middle of inner margin and a second one near inner basal angle. Membrane rather densely conspurcate with fuscous, more uniformly fuscous apically and at base, somewhat pale near apex of cuneus but invaded by fuscous spots, veins fuscous.

Legs: Coxae white, fusco-reddish laterally at base; femora black, pale at base, hind pair spotted with pale on ventral aspect, a rather distinct subapical pale band on dorsal aspect, front pair largely pale, with a longitudinal blackish bar on posterior aspect and a shorter but similar bar on apical half of anterior face; front tibiae reddish to black, with a pale annulus at middle of apical half, a narrower one near middle of basal half, and a third nearly obsolete pale annulus just below knee; intermediate tibiae chiefly pale but marked with dark reddish, hind pair pale but more or less darkened with blackish; tarsi fuscous. Venter: Blackish, sides irregularly tinged with reddish; genital segment with a broad erect tubercle above base of left clasper, somewhat notched at top, also a small tubercle above base of right clasper, claspers distinctive of the species.

Female: Length 6.2 mm., width 1.9 mm.; more robust than the male but very similar in coloration. Antennae: Segment i, length 1.64 mm.; ii, 3.4 mm.; iii, 2.3 mm.; iv, 1.7 mm. Pronotum: Length .86 mm., width at base 1.46 mm.

Massachusetts, New Jersey, New York.

Phytocoris davisi Knight, new species.

Female: Length 6.3 mm., width 2 mm. Head: Width 1.06 mm., vertex .46 mm., pale testaceous or white, with a black band extending across front between bases of antennae and touching

base of tylus; a line behind lower margin of eye and a small mark just above base of antenna, black; clothed with pale pubescence, front with a few blackish hairs intermixed. Rostrum, length 3.2 mm., attaining base of ovipositor, pale, blackish at apex.

Antennae: Segment i, length 1.61 mm., black, dorsal aspect with large spot on middle, small one near apex, and two or three small ones near base, white, beset with several white and dusky setae; ii, 3.14 mm., black, with broad pale band at base and one on middle; iii, 1.86 mm., blackish, pale at base and for a space beginning at middle; iv, 1.26 mm., fuscous.

Pronotum: Length .91 mm., width 1.54 mm.; basal margin of disk nearly as in *antennalis*, lateral margins broadly black, central area of disk, calli except outer margins, and collar except spot on sides, pale testaceous; disk clothed with white sericeous pubescence and intermixed with short black hairs; propleura pale, bordering dorsal margin, a line across lower margin of coxal cleft and extending to basal margin, black; xyphus pale. Scutellum pale testaceous, somewhat darkened with fuscous, an obsolete pale median line is apparent, clothed with pale sericeous pubescence and with short black hairs intermixed. Sternum blackish, pale along median line, pleura blackish, ostiolar peritreme pale.

Hemelytra: Embolar margins slightly arcuate; clothed with pale sericeous pubescence and intermixed with short black hairs; pale testaceous and darkened with fuscous and black; embolium blackish, interrupted with large pale spots; corium blackish on inner apical angle, distinctly pale at outer apical angle, radius indicated by blackish on apical half; clavus becoming fuscous on disk; cuneus pale, apex and spot at middle of inner margin black, clothed with short black hairs. Membrane pale, rather thickly and uniformly conspurcate with fuscous, a small nearly clear spot at apex of cuneus and a second one at margin slightly beyond; veins pale, that between areoles fuscous.

Legs: Pale, femora irregularly marked with large black spots on apical half, hind femora with one or two large black marks on dorsal surface just short of middle; front tibiae with band at apex, a narrower one at middle, and a smaller one at middle of basal half, black; intermediate tibiae narrowly fuscous at apex, band at middle, one at middle of basal half, and a third at slightly beyond middle of apical half, black; hind tibiae pale, irregularly darkened with fuscous, spines yellowish; tarsi pale, apex and base becoming fuscous.

Venter: Pale to nearly white, a broad band along dorsal margin, apical segment and vagina exterior, black; clothed with pale to yellowish pubescence.

Holotype: Female, 23 July, Lakehurst, N. J. (Wm. T. Davis); author's collection. Paratype: Female, 29 July, 1912, Central Park, Long Island, N. Y. (Wm. T. Davis).

Named in honor of the collector, Mr. Wm. T. Davis.

***P. conspurcatus** Knight.

Bull. Brook. Ent. Soc., xv, 61, 1920.

Male: Length 5.9 mm., width 2.1 mm. Distinguished by the dark conspurcate membrane and by the pale band at middle of antennal segments ii and iii; dorsum thickly clothed with black deciduous scale-like hairs and intermixed with small patches of white tomentum.

Head: Width 1.06 mm., vertex .34 mm., infuscated similarly to *eximius*. Rostrum, length 2.6 mm., attaining base of genital segment. Antennae: Segment i, length 1.2 mm., black, irregularly irrorate with white, beset with from fourteen to sixteen pale setae; ii, 2.5 mm., black, annulated at base with pale, a second pale band beginning at middle and covering a space of .3 mm. on base of apical half; iii, 1.48 mm., pale at base and again at middle; iv, 1.11 mm., black.

Pronotum: Length 1.54 mm., width at base 1.7 mm.; form and coloration very similar to *eximius*, but differs by the presence of black scale-like hairs; scutellum thickly covered with white tomentum.

Hemelytra: Rather uniformly darkened, a pale triangular spot at tip of corium bordering the cuneus; thickly clothed with black scale-like hairs and intermixed with small patches of white tomentum. Membrane thickly conspurcate with dark fuscous, cubitus pale at apex of larger areole, conspurcate spots more sparsely placed near apex of cells.

Legs: Marked very similarly to those of *eximius*, the pale band near apex of hind femora more or less interrupted on under side. Venter: Dark fuscous to blackish, more or less pale on under side at base; genital claspers and the long tubercle above base of left clasper (fig. 149: 16), distinctive of the species.

Female: Very similar to the male in size and coloration.

This is a predaceous, bark-inhabiting species which the writer has taken on the boles of Linden (*Tilia*), Pear (*Pyrus*), and Maple (*Acer*); frequently attracted to lights.

Hartford, 12 Sept., 1907 (W. E. B.); Wallingford, 3 Aug. (D. J. C.).

***P. sulcatus** Knight.

Bull. Brook. Ent. Soc., xv, 64, 1920.

Male: Length 6 mm., width 1.8 mm. In form very similar to *fumatus* but smaller; pronotum more distinctly sulcate at sides and immediately behind the calli; pale annulations more distinct at base and middle of segment ii; dorsum distinctly paler, outer half of clavus and inner apical angles of corium blackish; femora broadly pale at base, irrorate with large pale spots on apical half. Genital claspers, flagellum, and the large thick tubercle above base of left clasper (fig. 149: 15), distinctive of the species.

Female: Very similar to the male in coloration, but in form more robust and the embolar margins more distinctly arcuated.

Occurs on the bark of Linden (*Tilia*), and on bur oak (*Quercus macrocarpa*).

Branford, 22 Aug., 1904 (H. W. W.).

P. vittatus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 28, 1909.

Female: Length 7.3 mm., width 2.2 mm. Head: Width 1.08 mm., vertex .46 mm.; clothed with long pale pubescence, front and vertex also bearing white sericeous, almost scale-like hairs; pale testaceous, front obliquely marked with more or less interrupted brown lines, geminate mark on base of tylus, transversely but irregularly across middle of tylus, basal margin of jugum, dorsal margin of lorum, dorsal margin of buccula, and line behind lower half of eye, reddish brown to fuscous; lora prominent, facial angle equal to a right angle. Rostrum, length 3.3 mm., reaching upon fifth abdominal segment, pale to yellowish, a reddish streak on basal segment, last two segments fuscous to piceous.

Antennae: Segment i, length 1.73 mm., fusco-reddish, dorsal surface with from ten to twelve white glabrous spots, beset with prominent white bristles which in length exceed thickness of segment, the dark areas clothed with recumbent black hairs, thickest near base, more slender just before apex; ii, 2.4 mm., slender, fuscous, a prominent pale spot on dorsal surface next to base, a much smaller one slightly beyond, a moderately broad pale or yellowish band on middle but its margins not sharply defined, the fine pubescence taking color of segment beneath; iii, 1.77 mm., uniformly dark fuscous, with pale annulus at base; iv, missing.

Pronotum: Length 1 mm., width at base 1.77 mm.; testaceous to grayish, lateral margins of disk becoming fuscous, a sinuate interrupted black line forming next to slender pale margin; clothed with short stiff black hairs and between with white sericeous scale-like pubescence, distinctly thicker along median line, bristle-like hairs on collar white; propleura fuscous, lower margins and xyphus white. Scutellum fuscous to black, irregularly on median line of apical half, basal angles, and along lateral margins, somewhat pale; mesoscutum fuscous to black, clothed like the scutellum with white sericeous scale-like hairs and intermixed with more erect dark hairs. Sternum and pleura fuscous, lower margin of epimeron and ostiolar peritreme white.

Hemelytra: Embolar margins only very slightly arcuate on middle; thickly clothed with sericeous scale-like white pubescence, most abundant bordering claval suture, and interspersed with more erect fuscous to black hairs; clavus fuscous to black, more nearly black on apical half, somewhat paler bordering commissure except apically; corium testaceous to fuscous, a distinctive longitudinal black stripe on apical half of mesocorium, exocorium nearly pale, radial vein outlined with blackish but interrupted to form spots

on apical half; embolium pale testaceous, blackish at apex, irregularly darkened on apical half; cuneus pale fuscous, outer margin pale, apex and inner margin becoming black. Membrane uniformly dark fusco-brownish, irregularly conspurcate with white, a slightly larger pale spot on margin near apex of cuneus, veins fusco-brownish.

Legs: Coxae pale yellowish, lateral aspect showing some reddish brown, posterior pair with more fuscous; front femora chiefly pale, posterior face with two longitudinal fusco-reddish lines which are broken on margins by pale irrorations, anterior aspect with longitudinal pale line separating blackish color, apical one-fifth nearly black but with pale spots; intermediate femora more broadly blackish on apical half; hind femora chiefly blackish, pale at base except on antero-ventral aspect, irrorate with small pale spots, three or four slightly larger spots on dorsal aspect, about three white spots joining to form an oblique mark near middle of apical half, pubescence and spines white; tibiae pale and irregularly marked with reddish and fuscous, front pair nearly black, with pale band at middle of apical half and one at middle of basal half, with two or three pale spots just below knee, spines white; tarsi fuscous to black, slightly paler on middle.

Venter: Reddish to fuscous, more nearly black on vagina exterior and genital segments, irregularly marked with pale, chiefly reddish and pale on ventral aspect anterior to base of ovipositor; pale to yellowish pubescent.

Described from the type which is in the U. S. National Museum: Female, 12 Aug., 1904, Lake Placid, N. Y. (Van Duzee).

Thus far the writer has seen only the type specimen, and judging by the amount of material handled this species must be very limited in distribution.

P. tuberculatus Knight.

Bull. Brook. Ent. Soc., xv, 64, pl. 1, fig. 7, 1920.

Male: Length 6.5 mm., width 2.1 mm. Very similar to *fumatus*, especially in the white coloration on lower half of head. Antennae: Segment i, length 1.42 mm., equal to the distance from base of pronotum to a line drawn through the middle of eyes, and in this respect nearly identical with *fumatus*. Distinguished by having all the femora black, posterior pair with an oblique pale band near apex, and adjacent to this with a few small pale freckles as in *corticevirens*. Genital claspers, flagellum, a long tubercle above base of left clasper and a shorter one above the right clasper, distinctive of the species (fig. 149: 7).

Female: Very similar to the male but slightly more robust, frequently lighter colored.

New York, Michigan, North Carolina.

***P. corticevivens** Knight.

Bull. Brook. Ent. Soc., xv, 63, pl. 1, fig. 6, 1920.

Male: Length 6.6 mm., width 2.3 mm. Very similar to *fumatus*, differs in having the lower half of head black except for a small spot at base of lora. Femora black, narrowly pale at base, with a few small pale freckles near apices, the hind pair with a distinct white oblique band just before apex which is broader and more distinct on the anterior and ventral aspects. Genital claspers, flagellum, and a tubercle above base of each clasper (fig. 149: 6), distinctive of the species.

Female: Very similar to the male but slightly more robust, frequently lighter colored.

Occurs on the bark of maple trees (*Acer saccharum*).

Lyme, 4 July (H. B. K.).

P. fumatus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 25, 1909.

Male: Length 7 mm., width 2.3 mm. Head: Width 1.17 mm., vertex .40 mm.; vertex with large alutaceous spot each side of median line, a pair of similar but smaller triangular spots at base of frons; front obliquely striate each side of median line with five blackish lines, transversely black between bases of antennae; lower half of face white, base of tylus, base of jugum, and spot on dorsal margin at base of lorum, black, a somewhat interrupted reddish band across middle of tylus. Rostrum, length 4.2 mm., attaining base of genital segment, pale, brownish on apical segment.

Antennae: Segment i, length 1.57 mm., equal to the distance between base of pronotum and a line drawn through eyes at a point slightly before middle, blackish, dorsal aspect marked with pale spots, the two largest spots on apical half; ii, 3.1 mm., brownish black, pale at base of dorsal aspect, a nearly obsolete yellowish spot on middle as seen from dorsal aspect; iii, 1.79 mm., blackish, pale at base for space of .17 mm.; iv, 1.3 mm., blackish.

Pronotum: Embolar margins only very slightly arcuate; fuscous to blackish, a large translucent spot at apex of exocorium, embolium irregularly translucent and darkened with fuscous; cuneus scarcely paler at base, a black tuft of hairs on inner margin near base and a similar tuft at apex of endocorium; pubescence blackish, intermixed with pale sericeous pubescence. Membrane pale, thickly and rather uniformly conspurcate with fusco-brownish; veins dark, pale at apex of larger areole.

Legs: Dark brownish black, coxae except spot near base, and trochanters, pale; femora irrorate with small pale spots, a slightly larger pale spot on anterior aspect near apex but hardly suggestive of a subapical band; front and middle tibiae pale on middle and with rather distinct pale band at middle of apical half; tarsi fuscous.

Venter: Black, yellowish pubescent; genital segment and claspers distinctive (fig. 149: 8).

Female: Length 7.6 mm., width 2.6 mm.; larger and more robust than the male, very similar in coloration but the dorsum lighter colored; antennal segment i longer, equal to distance between basal margin of pronotum and a line drawn through front margins of eyes.

Massachusetts, Long Island, N. Y.

P. dimidiatus Kirschbaum.

Phytocoris dimidiatus Kirschbaum, Jahrb. Ver. Nat. Herz. Nassau, x, 199, 282, 1855; (Sep.) Caps. v. Wiesb., 39, 122, 1855.

Reuter, Hem. Gymn. Eur., v, 265, 1896.

Phytocoris dubius Douglas and Scott, Brit. Hem. Het., 305, 1865.

Male: Length 6.4 mm., width 2.3 mm. Head: Width 1.08 mm., vertex .40 mm.; testaceous and marked with brownish above, front with five oblique brownish lines each side of median line; tylus pale, a transverse reddish to black band across middle which has its lower margin in line with lower margins of juga; pale about base of antenna, a large black spot on base of juga, lora reddish black, pale apically except along margins; bucculae dark, gula white. Rostrum, length 2.8 mm., just attaining base of fifth abdominal segment, pale, brownish on apical segment.

Antennae: Segment i, length 1.32 mm., brownish black, nearly pale beneath, dorsal aspect with eleven or twelve irregular white glabrous spots, clothed with short black hairs and beset with about one pale or black bristle for each of the white spots; ii, 2.57 mm., blackish, base and annulus at slightly beyond middle, pale; iii, 1.63 mm., black, pale at base; iv, 1.08 mm., blackish.

Pronotum: Length 1.04 mm., width at base 1.08 mm.; disk testaceous to fuscous and with a tinge of greenish, narrow lateral margins, median line behind calli, irregularly along subbasal margin, blackish; calli yellowish to brownish, with one or two dark marks on disk; clothed with yellowish and blackish pubescence intermixed; propleura black, beneath a line drawn through lower margin of coxal cleft, white. Scutellum testaceous to blackish, median line pale apically, blackish bordering the pale. Sternum and pleura blackish, ostiolar peritreme white.

Hemelytra: Embolar margins very slightly arcuate; blackish, a triangular pale area at apex of cuneus; a somewhat paler area at middle and at near base of corium, inner margins of clavus and irregularly along claval vein slightly paler; embolium pale to yellowish and marked with blackish; clothed with yellowish and blackish pubescence intermixed. Cuneus yellowish, irregularly darkened with fuscous, apex and one or two spots along inner margin black, outer margin becoming reddish. Membrane pale, irregularly and rather thickly conspurcate with blackish, larger areole with basal one-fourth and narrowly bordering the black radius, uniformly blackish; cubitus pale along apices of areoles, also a small pale spot bordering apex of cuneus.

Legs: Coxae pale, a fuscous spot near base of lateral aspect; hind femora black, marked with large and small pale spots, with an oblique subapical pale band, basal one-fourth of anterior and posterior aspects pale; front and intermediate femora blackish but with pale spots largely confluent so that the black color is separated into streaks and spots, the blackish color most prominent dorsally on apical half; front tibiae black, triannulate with pale, basal band below knee less conspicuous; intermediate tibiae black, a black band at middle separating two prominent pale bands, the third pale band at apex but with tip of tibia fuscous; hind tibiae blackish, irregularly marked with small nearly glabrous pale spots, the pale spots confluent for a space at middle of basal half; tarsi fuscous, paler on second segment.

Venter: Black, somewhat yellowish along ventral median line; genital segment without tubercles, claspers distinctive (fig. 136).

Described from a single specimen, male, 27 Aug., 1917, Kentville, Nova Scotia (W. H. Brittain).

Key to Species of Phytocoris, Group II.

In this group accurate determinations can be expected only when making use of the male genital claspers. Once the male is correctly determined, females of the same species can usually be recognized by the general similarity of coloration, differences which are apparent yet very difficult to formulate in a key. For determining fully mature and well preserved specimens the following key should prove useful but the male genital claspers should be examined when possible.

1. Corium with distinct black or dark fuscous mark across apical area, extending obliquely from radius across to inner apical angle of corium, the dark mark never broken with paler irrorations ... 2
- Corium without distinct black mark across apical area, sometimes fuscous but the dark color broken by paler irrorations, but if not, then the black color on radius distinctly darker than the oblique infuscation 10
2. Pronotal disk uniformly deep black, narrow basal margin pale; scutellum yellowish, with an oblique black mark each side of median line which begins at middle of disk and extends to margin at a point barely beyond middle (p. 636) *nigricollis* n. sp.
- Pronotal disk pale grayish to blackish, always paler on middle and never deep black 3
3. Scutellum with distinct black mark on each side of apical half which extends from lateral margin obliquely cephalad to near middle of disk 4
- Scutellum with black spot at margin each side of apical half, but scarcely longer than broad, at most not extending more than half way to middle of disk 7
4. Pale color on lower margins of propleura not extending upon sides of sternum 5
- Pale color on lower margins of propleura extending upon sides of sternum; hind femora black except at base, pale irrorations small, the largest spot not wider than the narrow pale band at slightly beyond middle of apical half (p. 639) *husseyi* n. sp.

5. (Female) Hind femora with large irregular pale spots on anterior face, spots connected by a longitudinal pale bar although not attaining the subapical pale band; large, length 7.3-7.6 mm. (p. 638) **onustus**
- (Female) Hind femora with small spots, without distinct longitudinal pale bar on anterior face 6
6. Membrane with infuscation on central area tending to separate into small specks; front of head transversely striate with black lines each side of median line (p. 634) **neglectus**
 Membrane more uniformly infuscated, infuscation not separating into small specks; front of head not distinctly striate with black even when the hemelytra are very dark, although reddish lines usually evident (p. 638) **spicatus**
7. (3) Hind femora with distinct white band placed at slightly beyond middle of apical half, usually with large pale spots near middle 8
 Hind femora without distinct white band on apical half, pale spots usually rather small 9
8. Antennal segment ii distinctly pale or yellowish on dorsal aspect, but darker on apex and next to pale annulus at base; scutellum and clavus clothed with yellowish hairs and intermixed with shorter sericeous white pubescence; membrane somewhat fuscous on middle (p. 632) **eximius**
 Antennal segment ii black except at base, dorsal aspect not distinctly paler; scutellum and clavus clothed with black hairs and intermixed with prominent white sericeous pubescence (p. 640) **buenoi**
9. Corium with very heavy triangular black mark set obliquely across apex of corium; cuneus usually reddish (p. 640) **erectus**
 Corium with light, almost interrupted fuscous mark set obliquely across apex of corium; cuneus rarely if ever reddish (p. 634) **brevifurcatus**
10. (1) Corium not distinctly green 11
 Corium distinctly greenish on apical half; antennal segment ii black but with pale annulus at base (p. 640) **penipecten**
11. Hemelytra more brownish than black, dark color on apical area of corium and on middle of clavus broken into small spots, pubescence chiefly golden brown (p. 639) **salicis**
 Hemelytra sometimes brownish but the dark color not distinctly broken into small spots 12
12. Front and vertex transversely marked with blackish lines 13
 Front and vertex pale to yellowish, not distinctly marked with blackish, rarely with short red lines indicated near each eye; scutellum pale to yellowish, a small rounded brown to fuscous spot each side by margin at middle of apical half (p. 635) **angustulus**
13. Scutellum chiefly pale to grayish, but with black mark at each side on apical half 14
 Scutellum chiefly brownish black, irregularly maculated with paler, median line slenderly pale but irregularly invaded with darker color (p. 641) **obtectus**
14. Corium with a longitudinal pale area which extends upon base of cuneus without interruption by an oblique infuscation; a black line formed along radius but curving outward apically to the fracture (p. 638) **lacunosus**
 Corium rather distinctly darkened with fuscous on apical half, scarcely showing paler by contrast with dark marks along radius (p. 638) **cortitectus**

P. eximius Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxvi, No. 9, 67, 1876.

Bull. Brook. Ent. Soc., xv, 51, 1920.

Male: Length 5.7 mm., width 2 mm. Head: Width .94 mm., vertex .35 mm.; yellowish, frequently tinged with reddish; geminate mark at base of tylus and apical half excluding a pale spot on each side opposite tips of lora, dorsal margin of lora, juga, bucculae, and a ray passing lower margin of eye, reddish brown to fuscous or black; front clothed with long pale hairs. Rostrum, length 2.4 mm., attaining basal margin of genital segment, yellowish, blackish toward the apex.

Antennae: Segment i, length 1.28 mm., yellowish, irregularly mottled with fuscous, bearing five or six long pale setae; ii, 2.77 mm., fuscous, pale at base for space of .17 mm., the infuscation distinctly paler on dorsal aspect of middle third and becoming darker toward each end; iii, 1.6 mm., dark fuscous, pale at base for space of .14 mm., and again very narrowly at apex; iv, 1.25 mm., blackish.

Pronotum: Length .91 mm., width at base 1.6 mm., anterior angles .57 mm., collar .64 mm.; lateral margins very slightly sulcate, gently rounded basally; disk moderately arched, an even contour maintained behind calli and at lateral margins; calli oval, slightly separated, delimited behind by an impressed margin, pale with one or two fuscous marks on outer half; disk testaceous to fuscous, central area frequently grayish green, paler anteriorly, narrow basal margin pale, sub-basal margin with six blackish points that frequently join; disk distinctly hairy, longest hairs at anterior angles, hairs taking the color of the surface where they arise; collar pale, marked with reddish each side of the median line, bearing several prominent pale hairs; propleura blackish, lower margins and mark across base of coxal cleft, pale. Scutellum testaceous, a pair of diverging black vittae just before apex, becoming paler toward the median line; mesoscutum moderately exposed, sloping abruptly downward at lateral angles; heavily clothed with a mixture of pale and yellowish pubescence. Sternum blackish, a pale ray on each side behind ventral margin of propleura; pleura fuscous, narrow margins of sclerites, basalar piece, and ostiolar peritreme, pale.

Hemelytra: Clothed with prominent yellowish pubescence and intermixed with groups of white deciduous tomentum, dark hairs arising from the dark markings; greenish gray to fuscous, corium with base, middle, a triangular spot just before cuneus, several spots on the embolium, paler and more or less translucent; tip of embolium, an oblique nearly triangular patch lying just inside of radius at apex of corium, bordering the claval suture except on basal one-third, fuscous to black; clavus more or less fuscous either side of claval vein and bordering the claval suture. Cuneus grayish translucent, the apex, a small point along the inner margin and a second near basal angle, black; the paler part usually showing some brownish or reddish coloration. Membrane fuscous, a

large pale area just beyond the smaller areole and the tip of cuneus, divided by a small fuscous spot which touches the margin; central area more or less invaded by paler, cubitus distinctly pale at apex of areoles.

Legs: Coxae and bases of femora pale; front and intermediate femora with a series of irregular reddish brown to fuscous marks; posterior femora blackish, forming the background for many large and small irrorations, the pale patches most numerous and broadly joined on the inner side, an irregular pale annulation a short space before apex and a second one nearer the middle but interrupted on the outside. Tibiae annulated with fuscous and pale; front pair banded with fuscous at apex, narrowly at knee, and twice between these points; intermediate pair with the apical band becoming pale, the whole apical half being more pale than fuscous; hind pair infuscated, irregularly spotted with pale, broadly pale on basal one-third, delimited by blackish on inner side at base and by a distinct annulation at middle; spines pale to brownish; tarsi fuscous, arolia erect and diverging at the apices.

Venter: Clothed with prominent yellowish hairs, infuscated, yellowish on ventral side except the genital segment which is narrowly pale along median line and frequently on the sides near base of claspers. Genital claspers and flagellum (fig. 149: 1) distinctive of the species.

Female: Length 5.7 mm., width 2.05 mm. Very similar to the male in coloration; imperfect or poorly colored specimens can never with certainty be distinguished from the females of closely related species.

Occurs on a number of plants in various situations; is largely if not wholly predaceous as are a number of closely related species in this group.

East River, 5 Aug., 1910 (C. R. E.); New Haven, 29 July, 1920 (M. P. Z.); Portland, 12 Aug., 1913 (B. H. W.).

***P. brevifurcatus* Knight.**

Bull. Brook. Ent. Sci., xv, 53, 1920.

Male: Length 5.8 mm., width 2.14 mm. Very similar to *eximius* but without heavy oblique fuscous mark at apex of corium; second antennal segment darker fuscous on the middle third; head and pronotum distinctly grayish green on the paler parts; hind femora with smaller irrorations, not distinctly banded with pale; genital claspers and flagellum (fig. 149: 2) distinctive of the species.

New York.

***P. neglectus* Knight.**

Bull. Brook. Ent. Sci., xv, 54, 1920.

Male: Length 6.2 mm., width 2.2 mm. Resembles *eximius* but with antennal segment ii uniformly blackish except for the whitish annulation at base; corium and clavus usually more broadly black-

ish; apical band on intermediate tibiae white; infuscation at middle of membrane tending to separate into small specks; genital claspers and flagellum (fig. 149: 3) distinctive of the species.

Apparently there are two generations of this species in one season. The writer took specimens most frequently on the bark of apple trees where both adults and nymphs fed on Psocids. The species was also found on the bark of other trees and it is probably predaceous on most soft-bodied insects living in such situations.

Maine, Massachusetts, New York.

***P. angustulus* Reuter.**

Acta Soc. Sci. Fenn., xxxvi, No. 2, 29, 1909.

Male: Length 6.2 mm., width 2.1 mm. Head: width .96 mm., vertex .34 mm.; yellowish, bucculae and large spot at base of lorum blackish, tylus nearly uniformly yellowish. Rostrum, length 2.6 mm., attaining middle of sixth ventral segment, yellowish, blackish apically.

Antennae: Segment i, length 1.26 mm., chiefly pale yellowish, fuscous reticulations apparent and separating the more or less confluent pale spots; ii, 2.86 mm., fuscous, more yellowish on dorsal aspect, with pale annulus at base; iii, 1.5 mm., blackish, narrowly yellowish at base; iv, 1.1 mm., blackish.

Pronotum: Length 1 mm., width at base 1.66 mm.; fusco-grayish, calli and collar yellowish, disk becoming more nearly

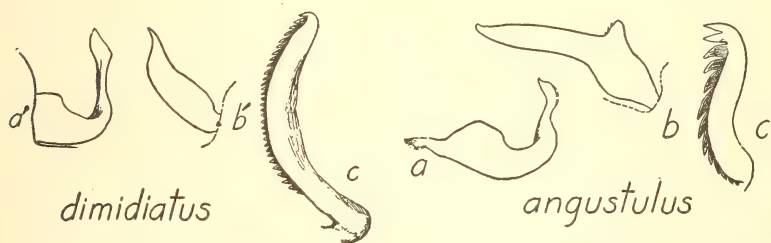


FIG. 136. *Phytocoris dimidiatus* Kirsch.,—male genital claspers, (a) left clasper, lateral aspect with outline of genital segment added, (b) right clasper, lateral aspect with outline of genital segment added, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

FIG. 137. *Phytocoris angustulus* Reuter,—male genital claspers, (a) left clasper, lateral aspect, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

fuscous laterally, basal submargin with two black marks each side of median line, slender basal margin yellowish; clothed with blackish and yellowish pubescent hairs, sparsely intermixed with white sericeous pubescence, thicker along median line; propleura blackish, lower margin and spot across top of coxal cleft pale.

Scutellum yellowish, a small brownish spot each side along margin of apical half. Sternum blackish, median line and spot behind lower margin of propleura, yellowish; propleura yellowish to fuscous, ostiolar peritreme white.

Hemelytra: Embolar margins scarcely arcuate; pale to yellowish and darkened with fuscous; clothed with yellowish to blackish pubescence and intermixed with spots of white sericeous tomentose pubescence; a triangular pale translucent spot at apex of corium which is confluent with pale on cuneus, also with the pale spot on middle and one near base of corium. Cuneus pale, apical half reddish to blackish, a black spot at middle of inner margin, also a spot on corio-membrane margin. Membrane uniformly dark fuscous, a paler area bordering apex of cuneus and smaller areole, somewhat pale at slightly distad of this spot but not extending to margin.

Legs: Coxae pale yellowish; femora blackish, thickly conspurcate with small pale spots, more broadly paler near base, hind pair with a subapical oblique pale band formed by coalescing pale spots; tibiae fuscous and with pale, indistinctly banded, hind pair chiefly fuscous but with broad pale area at middle of basal half.

Venter: Blackish, more yellowish on genital segment; genital claspers distinctive (fig. 137).

Female: Length 6.1 mm., width 2.1 mm.; very similar to the male in form and coloration.

Collected by the writer on *Tsuga canadensis*.

New York, Vermont, Nova Scotia.

***Phytocoris nigricollis* Knight, new species.**

Male: Length 5.1 mm., width 1.77 mm. Head: Width .92 mm., vertex .28 mm.; yellow, a reddish or blackish mark behind dorsal margin of eye; apical half of tylus, dorsal margins of lora, lora except apically, bucculae, and spot beneath eye, black, gula pale. Rostrum (female) length 2.34 mm., extending upon fifth abdominal segment, yellowish, blackish apically.

Antennae: Segment i, length .86 mm., pale yellowish, black on dorsal aspect but broken by large and small yellowish irrorations, clothed with short black and pale hairs, a pale bristle arising from each yellowish spot but in length little exceeding thickness of segment; ii, 2.24 mm., black, with pale annulus at base, clothed with short pale to dusky pubescence; iii, 1.18 mm., black, pale at base; iv, .97 mm., black.

Pronotum: Length .86 mm., width at base 1.47 mm.; deep black, a pale spot between calli which extends upon collar, narrow basal margin of disk white, with sinuate margin bordering the black; lower pleural margin and small spot at top of coxal cleft white; disk clothed with rather prominent black hairs, those arising from pale areas are likewise pale, sparsely intermixed with sericeous tomentose pubescence which takes ground color, most prominent

between calli and near margins of disk; xyphus and collar beneath white. Scutellum yellow, with an oblique black mark on apical half each side of median line, middle of mesoscutum and extending slightly upon scutellum also black; yellowish pubescent, a few dusky hairs on disk, basal angles, median line, and largely on mesoscutum, clothed with sericeous white tomentum. Sternum and pleura black, slender margin just in front of middle coxae, spot at lower margin of epimeron, and the ostiolar peritreme white.

Hemelytra: Embolar margins very slightly arcuate; clavus pale yellowish, becoming fuscous at middle bordering claval suture; corium black, base, spot on middle, and triangular mark at apex bordering cuneus, pale; embolium black, base and three or four spots on middle third, pale; clothed with pale and black pubescence, intermixed with small tufts of white sericeous pubescence. Cuneus yellowish, apex and inner margin except near base, black. Membrane uniformly blackish, a small pale spot at apex of cuneus, cubitus at apex of larger areole white.

Legs: Coxae pale; femora black, irrorate with small and moderately large yellowish spots, bases pale, front pair with pale extending to middle of anterior aspect, extending in the same manner on dorso-posterior aspect of hind pair; hind tibiae black, a broad pale band at middle of basal half, also a pale spot on dorsal

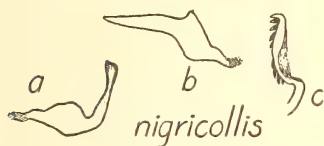


FIG. 138. *Phytocoris nigricollis* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

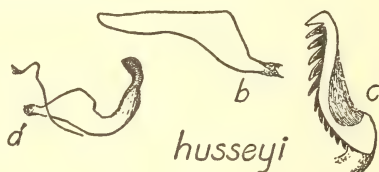


FIG. 139. *Phytocoris husseyi* Knight,—male genital claspers, (a) left clasper, lateral aspect with outline of genital segment added, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

aspect near knee, spines yellowish, usually a small yellowish spot at base of each; front and middle tibiae white, band at middle, apex, and middle of basal half, black; tarsi blackish.

Venter: Deep black, yellowish basally on ventral side, clothed with yellowish to brownish pubescence; genital claspers distinctive of the species (fig. 138).

Female: Length 5.1 mm., width 2 mm.; embolar margins slightly more arcuate than in the male; coloration very similar to male but more broadly pale on hemelytra. Head: Width .91 mm.,

vertex .34 mm. Antennae: Segment i, length 1.1 mm.; ii, 2.6 mm.; iii, 1.36 mm.; iv, 1 mm.

Holotype: Male, 7 Aug., 1918, Hampton, N. H. (S. Albert Shaw); author's collection. Allotype: Female, 14 July-5 Aug., 1912, Black Mountains, North Carolina (Beutenmuller); Cornell Univ. collection. The writer has also seen a third specimen which is in the United States National Museum collection.

P. onustus Van Duzee.

Proc. Calif. Acad. Sci., ser. 4, ix, 244, 1920.

Length male 7 mm., width 2.4 mm.; length female 7.4 mm., width 2.56 mm. Suggestive of *eximius* but larger and usually darker colored; distinguished in the key and by the genital claspers (fig. 149: 9).

The writer collected this species most frequently on the bark of hickory (*Carya*) trees situated in shaded humid surroundings.

Massachusetts, Maine, New York, Vermont.

P. spicatus Knight.

Bull. Brook. Ent. Soc., xv, 55, 1920.

Male: Length 6 mm., width 2 mm. Slightly larger than *eximius* and more broadly black; antennal segment ii uniformly black except for the white annulation at base; front largely black, transverse striae evident; hind femora as in *eximius* only darker, one distinct pale annulation just before apex; flagellum and right genital clasper distinctive of the species (fig. 149: 10).

Female: Length 6.8 mm., width 2.2 mm.; very similar to the male only slightly larger.

This species comes nearest to *cortitectus* but is readily distinguished by the sharp basal spike on the right clasper and by the darker coloration; also approaches *onustus* but is smaller and more blackish.

Maine, Massachusetts, New York.

P. cortitectus Knight.

Bull. Brook. Ent. Soc., xv, 55, 1920.

Male: Length 6 mm., width 2 mm. Very similar to *eximius*; pale parts of hemelytra more translucent, infuscations paler; front of head transversely striate with fuscous each side of the median line; antennal segment ii more uniformly fuscous, but with a pale reflection apparent throughout the infuscation; genital claspers and flagellum distinctive of the species (fig. 149: 11).

Female: Very similar to the male but slightly more robust.

The writer took specimens only on the trunks of elm trees (*Ulmus*) where the species is admirably concealed as it crouches in crevices of the bark.

New Hampshire, New York.

P. lacunosus Knight.

Bull. Brook. Ent. Soc., xv, 56, 1920.

Male: Length 6.7 mm., width 2.2 mm. Very similar to *cortictectus* only larger; nearly the size of *onustus* but more slender and paler in color; corium with a longitudinal pale area which extends upon base of cuneus without interruption at the cubitus; flagellum and right genital clasper distinctive of the species (fig. 149: 4).

Female: Very similar to the male only slightly more robust.

Occurs on the bark of *Carpinus caroliniana*.

New York.

***P. salicis** Knight.

Bull. Brook. Ent. Soc., xv, 56, 1920.

Male: Length 6 mm., width 2.1 mm. Very similar to *eximius* but distinctly brownish above; fuscous coloration of the hemelytra interspersed with brownish maculations; antennal segment ii more distinctly pale fuscous, becoming dark only at apex and next to the pale basal annulation; membrane paler on the central area and with a median pale ray extending to apex; genital claspers and flagellum distinctive of the species (fig. 149: 13).

Female: Very similar to the male in size and coloration.

Breeds on willow, chiefly *Salix nigra*, where the species appears to be predaceous on soft-bodied insects living on that tree.

Branford, 15 July, 1904 (H. W. W.); Litchfield, 22 July, 1920 (P. G.).

Phytocoris husseyi Knight, new species.

Male: Length 5.1 mm., width 2 mm. Head: Width 1.04 mm., vertex .33 mm.; pale to yellowish, median line of front and two or three incomplete oblique lines at each side reddish to blackish; lower part of front, base of tylus, lower half of tylus except for small spot each side by lora, about base of antenna, basal half of juga, dorsal margin of lora, and bucculae, reddish to black, gula and areas between the black, white. Rostrum, length 2.26 mm., reaching upon fourth ventral segment, pale, apex blackish.

Antennae: Segment i, length 1.18 mm., deep black, dorsal aspect with two large and six or seven small white spots, setae pale to blackish; ii, 2.4 mm., black, pale at base, somewhat brownish at middle of dorsal aspect; iii, 1.41 mm., black, pale at base; iv, 1.2 mm., black.

Pronotum: Length .91 mm., width at base 1.6 mm.; nearly as in *erectus* but calli and between, more yellowish. Scutellum pale to yellowish, with heavy oblique black mark on apical half each side of median line, brownish color extending cephalad from the black marks. Sternum black, pale area extending behind lower white margin of propleura; pleura black, ventral margin of epimeron and the ostiolar peritreme white.

Hemelytra: Nearly as in *erectus* but with more black, disk of clavus blackish but broken by paler irrorations of brownish and fuscous; clothed with erect short blackish hairs and intermixed with tufts of white sericeous tomentose pubescence, more nearly like *buenoi* in this respect. Cuneus yellowish to dusky, apical half

fuscous to black but irrorate with paler spots, outer basal margin greenish; apex of mesocorium bordering inner basal angle of cuneus fuscous, with black spot on corio-membrane margin, the pale spot at apex of corium not extending upon cuneus. Membrane suggestive of *erectus* by having two fuscous areas each side on apical half, but differs by having central area fuscous as well as the basal area more broadly blackish.

Legs: Rather similar to those of *erectus* but differs in having a clearly defined, although narrow subapical pale annulus on hind femora.

Venter: Blackish, pale beneath but rather narrowly on genital segment; genital claspers (fig. 139) distinctive of the species, exhibiting a close relationship with *buenoi*.

Holotype: Male, 12 Aug., 1921, Mendon, Mercer County, Ohio (R. F. Hussey); author's collection. Named in honor of the collector, Mr. R. F. Hussey.

**P. buenoi* Knight.

Bull. Brook. Ent. Soc., xv, 57, 1920.

Male: Length 5.8 mm., width 2 mm. Resembles *eximius* but the colors of the dorsum are more in contrast; front and middle femora dark fuscous brown, closely and irregularly maculated with pale; black patch bordering the cubitus strongly contrasted with the pale spot which joins the base of cuneus, pale part of cuneus tinged with roseous; central area of membrane distinctly pale; genital claspers and flagellum (fig. 149: 14) distinctive of the species.

Female: Very similar to the male in size and coloration.

Occurs on Norway Spruce (*Picea*).

New Haven, 27 June, 1904 (W. E. B.).

P. erectus Van Duzee.

Proc. Calif. Acad. Sci., ser. 4, ix, 345, 1920.

Male: Length 5.4 mm., width 2 mm. Head: Width .94 mm., vertex .36 mm. Antennae: segment i, length 1.16 mm., more broadly pale than in *husseyi*; ii, 2.5 mm.; iii, 1.28 mm.; iv, 1.2 mm. Pronotum: Length .87 mm., width at base 1.56 mm.

Very similar to *husseyi* in size and coloration, the pale areas of dorsum more uniformly brownish, cuneus reddish, and hind femora without distinct subapical pale band. Genital claspers very distinctive (fig. 149: 5).

Maine, Massachusetts, New Hampshire, New York.

**P. penipecten* Knight.

Bull. Brook. Ent. Soc., xv, 58, 1920.

Male: Length 5.1 mm., width 1.9 mm. Very similar to *eximius*; antennal segment ii uniformly infuscated except the pale annulus at base; apical half of corium and bordering the claval vein, distinctly olive green; flagellum and genital claspers (fig. 149: 12) distinctive of the species.

Female: Length 5.5 mm., width 2 mm. Very similar to the male in coloration but in form slightly more robust.

East River, Sept., 1910 (C. R. E.); New Canaan, 14 Sept., 1905 (W. E. B.).

P. obtectus Knight.

Bull. Brook. Ent. Soc., xv, 58, 1920.

Male: Length 5.5 mm., width 1.85 mm. Very similar to *eximius* but slightly smaller and more slender; hemelytra more uniformly grayish translucent, not distinctly marked with fuscous at apex of corium; front transversely striate with fuscous; scutellum chiefly brownish black, irregularly maculated with paler, median line slenderly pale but irregularly invaded with darker color; genital claspers and flagellum (fig. 149: 21) distinctive of the species.

Female: Very similar to the male in size and coloration.

New York.

Key to Species of Phytocoris, Group III.

1. Hemelytra rather uniformly rufescent, embolium and cuneus yellowish translucent **mundus** 2
Hemelytra not uniformly rufescent 2
2. Hemelytra yellowish to fulvous, clavus not darker than corium 3
Hemelytra more nearly fuscous than yellowish, irregularly tinged with reddish, clavus darker than outer margin of corium 5
3. Femora with paler maculae very small, nearly obsolete; pale yellowish, darkened with fulvous on outer half of clavus and inner half of corium; cuneus yellowish translucent, reddish yellow apically **fulvus**
Femora with pale maculae distinct, but if not, then with inner half of cuneus distinctly roseous 4
4. Hemelytra uniformly yellowish brown translucent, sometimes tinged with reddish at base of cuneus; scutellum uniformly yellowish to reddish, never paler on median line or apex **uniformis** n. sp.
Hemelytra fulvous to reddish on inner half of corium, inner half of cuneus roseous; scutellum with fulvous each side of middle, median line and apex distinctly paler **diversus**
5. Hind femora fusco-reddish, with distinct small white irrorations but never forming a distinct subapical band **conspersipes**
Hind femora fuscous, with small yellowish maculae but dorsal surface with a rather broad subapical band or transverse pale spot **pinicola**

P. mundus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 18, 1909.

Length 4.2 mm., width 1.6 mm. Hemelytra and scutellum rather uniformly rufescent, embolium and cuneus yellowish translucent; membrane uniformly pale fumate, veins yellowish.

Male: Head: Width .91 mm., vertex .37 mm. Antennae: Segment i, length .61 mm., uniformly yellowish, dusky pubescent and with seven or eight setae; ii, 1.7 mm., blackish, more yellowish at

base; iii, .98 mm., black; iv, 84 mm., black. Genital claspers (fig. 149: 22) distinctive of the species.

Breeds on *Pinus virginiana*.

New Jersey, Maryland, District of Columbia.

P. fulvus Knight.

Bull. Brook. Ent. Soc., xv, 59, 1920.

Male: Length 6 mm., width 2 mm. Head: Width 1.08 mm., vertex .34 mm. Antennae: segment i, length .88 mm., yellow but with paler spots apparent, dusky pubescent, setae yellowish to dusky; ii, 2.5 mm., yellowish, infuscated apically; iii, 1.25 mm., black, yellowish at base; iv, .93 mm., black.

Suggestive of *mundus* but larger, more elongate and paler in color; pale yellowish, darkened with fulvous on outer half of clavus and inner half of corium; apical half of femora perceptibly darkened but small pale irrorations are visible; membrane pale, uniformly tinged with fumate, the veins fulvous; genital claspers and flagellum (fig. 149: 23) distinctive of the species.

Female: Very similar to the male in size and coloration.

Breeds on *Pinus strobus*.

Maine, New York.

P. pinicola Knight.

Bull. Brook. Ent. Soc., xv, 59, 1920.

Male: Length 5.2 mm., width 1.8 mm. Head: Width .96 mm., vertex .36 mm. Antennae: Segment i, length .54 mm., pale yellowish to dusky, dorsal surface with pale glabrous spots, two brownish black setae set on margin of each glabrous spot; ii, 1.97 mm., blackish, paler beneath; iii, .92 mm., blackish, narrowly pale at base; iv, .50 mm., blackish.

In coloration most suggestive of *conspersipes* but the genital structures show it to be more closely related to *mundus*; more slender than *conspersipes*, spots on femora and tibiae less distinct, usually orange-yellow; genital claspers and flagellum distinctive of the species (fig. 149: 17).

Female: Similar to the male in coloration, but shorter and more robust in form.

Breeds on *Pinus resinosa* and *P. silvestris*.

Records: MASSACHUSETTS—15 Sept., 1914 Blue Hills (H. M. Parshley); 15 July-6 Aug., 1917, Woods Hole (C. E. Olsen). The type specimens came from New York.

P. diversus Knight.

Bull. Brook. Ent. Soc., xv, 60, 1920.

Male: Length 5 mm., width 1.7 mm. Head: Width .97 mm., vertex .37 mm. Antennae: Segment i, length .71 mm., greenish, darkened with fusco-brownish, irrorate with paler on inner side, beset with nine or ten dark bristles; ii, 2.05 mm., infuscated, paler on basal half; iii, 1.05 mm., blackish; iv, .85 mm., blackish.

Structurally, nearly identical with *conspersipes* but form more slender, length of antennal segment ii greater as compared with width of head; general aspect more nearly that of *fulvus*, the fulvous coloration more distinct on inner apical half of corium and on cuneus; head, pronotum, and ventral parts greenish, pronotum basally, sides of tylus, dorsal margins of juga and lora, base of head, indistinct transverse striae on front, sternum and sides of venter, tinged with reddish brown; femora except basally and tibiae, fusco-brownish, irrorate with pale, spots much enlarged on dorsal aspect of hind femora. Genital claspers and flagellum (fig. 149: 20) nearly identical with those of *conspersipes*.

Female: Very similar to the male in size and coloration.

Breeds on *Pinus strobus*.

Maine, Massachusetts, New Hampshire, New York.

P. conspersipes Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 22, 1909.

Male: Length 4.7 mm., width 1.8 mm. Head: Width 1.03 mm., vertex .37 mm. Antennae: Segment i, length .60 mm., fusco-brownish, irrorate with pale, setae fuscous; ii, 1.86 mm., black, narrowly pale at base; iii, .89 mm., black; iv, .82 mm., black. Pronotum: Length .82 mm., width at base 1.5 mm. Genital claspers distinctive of the species (fig. 149: 19).

Breeds on *Pinus virginiana*.

New Jersey, Maryland, District of Columbia.

Phytocoris uniformis Knight, new species.

Suggestive of a pale specimen of *pinicola* but differs in the pubescence on the dorsum; clothed with recumbent golden yellow pubescence and intermixed with tufts of white sericeous tomentum, the more erect hairs brownish while in *pinicola* black and very prominent.

Male: Length 5.2 mm., width 1.8 mm. Head: Width 1.03 mm., vertex .37 mm.; yellowish with a tinge of brown. Rostrum, length 1.9 mm., yellowish brown, blackish apically.

Antennae: Segment i, length .83 mm., brownish yellow, with nearly obsolete paler irrorations above, darkest specimens reticulate with reddish, setae yellowish to dusky, in length scarcely exceeding thickness of segment; ii, 2 mm., blackish, more yellowish basally; apical segments missing.

Pronotum: Length .77 mm., width at base 1.43 mm.; uniformly brownish yellow, clothed with golden to yellowish pubescent hairs, intermixed with white sericeous tomentum. Scutellum more deeply colored than pronotum but with pubescence similar. Sternum and pleura yellowish with a tinge of fulvous, ostiolar peritreme scarcely paler.

Hemelytra: Embolar margins very slightly arcuate; uniformly yellowish brown translucent, sometimes tinged with reddish on

base of cuneus; pubescence described above. Membrane uniformly fumate, sometimes tinged with yellowish, veins scarcely darker.

Legs: Pale to yellowish, femora reddish brown and irrorate with pale, posterior pair with slightly larger subapical pale spot on dorsal surface; tibiae with small reddish spots or reticulations.



FIG. 140. *Phytocoris uniformis* Knight,—male genital claspers, (aa) left clasper, dorsal aspect, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

Venter: Yellowish to reddish; genital claspers and flagellum (fig. 140) distinctive of the species; flagellum comes nearest to that of *fulvus* while the right clasper shows a closer relationship with *mundus*.

Female: Length 5.4 mm., width 2 mm.; more robust than the male but very similar in coloration. Head: Width 1.17 mm., vertex .51 mm. Antennae: Segment i, length .80 mm.; ii, 2.16 mm.; iii, 1.2 mm.; iv, .89 mm.

Holotype: Male, 21 Aug., 1917, Wyandanch, Long Island, N. Y. (Chris. E. Olsen); author's collection. *Allotype*: taken with the type. *Paratypes*: Males (3), taken with types. MASSACHUSETTS—Male, 15 July-6 Aug., 1918, Woods Hole (Chris. E. Olsen). Female, 9 Aug., 1914, Malden (C. A. Frost).

Key to Species of Phytocoris, Group IV.

- | | |
|--|---------------------------------|
| 1. Pronotal disk with four orange or red vittae on a paler background
Pronotal disk frequently red but without four distinct reddish
vittae on a paler background | 7
2 |
| 2. Pronotal disk with four black spots on basal submargin; scutellum
uniformly pale, sometimes obsoletely dotted with fuscous to form
a spot at each side on apical half | (p. 645) <i>quercicola</i> |
| Pronotal disk without four distinct black spots on basal submargin;
scutellum usually with orange or red at each side on apical half | 3 |
| 3. Pronotum with more pale or fuscous than red | 5 |
| Pronotum chiefly red, more red than pale or fuscous | 4 |
| 4. Hemelytra with distinct white irrorations; calli darkened with
fuscous | (p. 650) <i>confluens</i> |
| Hemelytra with white irrorations obsolete, nearly uniformly deep
orange-red; calli pale | (p. 653) (male) <i>puella</i> |
| 5. Scutellum uniformly bright yellow; hemelytra and pronotum
chiefly bright yellow, with an orange vitta along outer margin of
callus and extending somewhat to the rear ... | (p. 649) <i>luteolus</i> n. sp. |
| Scutellum with an orange or reddish mark at each side of median
line | 6 |

6. Pronotal disk with base and lateral margins dark fusco-reddish; scutellum yellow, with a red mark at each side on apical half but without vittae at middle of base (p. 646) *infuscatus*
 Pronotal disk chiefly pale, not distinctly darkened laterally or at base; base of scutellum with an orange colored vitta each side of median line and frequently extending to join with orange mark at each side of apical half (p. 647) *olseni* n. sp.
7. (1) Antennal segment ii without slender blackish line on anterior aspect; embolium and outer half of corium marked with reddish 8
 Antennal segment ii pale but with slender blackish line on anterior aspect; embolium and outer half of corium green; clavus greenish to fuscous, with a rather large irregular reddish blotch on middle and a smaller one on basal half (p. 649) *tibialis*
8. Hemelytra with triangular area just before cuneus, yellow; clavus, basal area of corium and embolium, and cuneus, bright red but irrorate with paler maculations (p. 651) *venustus* n. sp.
 Hemelytra with apical area of corium marked with reddish, or if not, then basal half of corium without bright red 9
9. Hind femora chiefly pale, marked with reddish only on apical half 10
 Hind femora heavily marked with red, the red color inclosing pale irrorations, basal one-third pale; hemelytra marked with dark red reticulations, more nearly fusco-reddish on basal half of corium (p. 654) *depictus* n. sp.
10. Dorsum pale, hemelytra reticulately marked with orange or pale reddish, apical area of corium as distinctly marked as the basal half; membrane pale, somewhat dusky at base (p. 653) *puella*
 Dorsum pale greenish yellow, reticulation of hemelytra dusky, apical area of corium without dark marks; membrane infuscated (p. 652) *caryae* n. sp.

P. quercicola Knight.

Bull. Brook. Ent. Soc., xv, 60, 1920.

Male: Length 4.7 mm., width 1.7 mm. Head: Width .91 mm., vertex .3 mm., basal half of lora, spot each side of tylus, transversely across the front and four marks on vertex, red, front with prominent pale hairs. Rostrum, length 2.2 mm., attaining base of genital segment, pale, infuscated at apex.

Antennae: Segment i, length .97 mm., pale, three irregular marks on dorsal surface, broadly banded at apex with fusco-brownish or reddish, beset with six to eight prominent pale spines; ii, 2.25 mm., pale brownish, pale annulus at base, next to this and again at apex darker fuscous; iii, 1.25 mm., fusco-brownish, annulated with paler at base, middle and narrowly at apex; iv, 1.04 mm., fuscous.

Pronotum: Yellowish, outer half of calli and extending broadly to the rear, narrowing and curving inward to form submarginal line on middle two-fourths, but interrupted at median line, fusco-brownish to dark fuscous; submarginal line frequently forming two blackish points each side of the median line, narrow basal margin pale; yellowish to dusky pubescent, longest hairs situated anteriorly and on collar. Scutellum pale, median line frequently reddish, each side of this with an indistinct vitta composed of small brownish dots.

Hemelytra: Pale, more or less translucent, an irregular patch

at middle of clavus and a larger one just opposite on the corium, fusco-brownish, the dark color broken by small irregular pale maculae; frequently the apex of corium with a smaller dark patch and a series of fusco-brownish spots bordering the claval suture; embolium and cuneus flecked with coagulate spots of reddish. Membrane pale, infuscation usually composed of fine irregular spots, forming a large spot on apex, a smaller one at each side joining margin, the central area and within the cells more sparsely marked with irregular flecks of fuscous; cubitus pale, radius infuscated.

Legs: Front and middle tibiae pale, triannulate with fuscous, femora and hind tibiae marked nearly as in *eximius*, infuscation frequently more or less reddish brown.

Venter: Pale, sides flecked with reddish, basal half of genital segment fuscous except along median line; flagellum and genital claspers (fig. 149: 24) distinctive of the species.

Female: Very similar to the male in size and coloration.

Breeds on *Quercus macrocarpa*.

Massachusetts, Maryland, New York.

P. infuscatus Reuter.

Acta Soc. Sci. Fenn., xxxvi, No. 2, 20, 1909.

Male: Length 5.3 mm., width 1.94 mm. Head: Width .88 mm., vertex .28 mm.; yellowish, dorsal half of juga, basal half of lora, somewhat on bucculae, and mark between bases of antennae, dark red; tylus dark red, geminate mark on basal half but separated by small wedge on base, yellowish; front and vertex clothed with prominent yellowish hairs, each side of front with indications of transverse reddish lines. Rostrum, length 2.7 mm., nearly attaining base of genital segment, yellowish, blackish at apex.

Antennae: Segment i, length 1.08 mm., pale to yellowish, fusco-brownish before apex, dusky at base, yellowish to dusky pubescent, basal half with five or six yellowish setae; ii, 2.74 mm., uniformly yellowish; iii, 1.49 mm., yellowish; iv, 1.2 mm., yellowish or uniformly dusky.

Pronotum: Length .84 mm., width at base 1.5 mm.; disk testaceous to fusco-reddish, basal submargin darker, calli and just between pale, dorsal aspect of collar pale, a reddish patch each side of median line, also an orange spot just behind inner angle of each callus; clothed with rather prominent pale to yellowish pubescence; propleura pale, a fusco-brownish line across lower extremity of coxal cleft and extending to near posterior margin, xyphus and collar beneath pale. Scutellum pale to yellowish, a reddish spot on margin each side of apical half but leaving the median line broadly yellowish. Sternum fuscous, paler on episternum, pleural sclerites fuscous but with margins pale, ostiolar peritreme pale.

Hemelytra: Embolar margins very slightly arcuate; reddish to fusco-reddish, irrorate with more or less confluent white spots.

basal half more fuscous than reddish; corio-membranal margin blackish; cuneus more heavily red, broken by small pale irrorations on middle. Membrane fumate to fusco-brownish, infuscation of areoles somewhat broken into small conspurcate spots, apical half with slightly darker fuscous area touching margin beyond cuneus.

Legs: Pale to yellowish, hind femora except basal one-third, reddish black, irrorate with small yellowish spots, with larger spots on dorsal aspect at middle, a yellowish band at slightly beyond middle of apical half, its margins irregular and nearly confluent on ventral side; front tibiae with indistinct brownish band on middle and at slightly below knee, hind pair with broad reddish band at base.

Venter: Yellowish to fuscous, darker laterally and on genital segment; genital claspers and flagellum distinctive of the species (fig. 141).

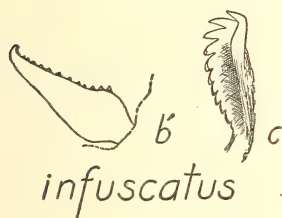


FIG. 141. *Phytocoris infuscatus* Reuter,—male genital claspers, (b) right clasper, lateral aspect with outline of genital segment added, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

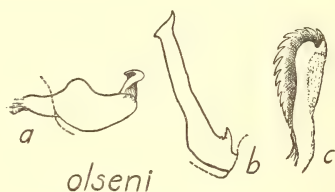


FIG. 142. *Phytocoris olseni* Knight,—male genital claspers, (a) left clasper, lateral aspect, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

Female: Length 5.5 mm., width 2 mm.; more robust than the male, very similar in coloration but more broadly pale on apical half of corium, with pale and orange rays behind calli.

Breeds on hickory (*Carya*).

Plesiotypes: Male and female, 31 July, 1916, Batavia, N. Y. (H. H. Knight); compared with type.

Massachusetts, New York, Pennsylvania.

***Phytocoris olseni* Knight, new species.**

Male: Length 6.1 mm., width 2.2 mm. Head: Width 1.03 mm., vertex .38 mm.; pale yellowish, vertex with mark each side at base, median line, arc each side of front composed of short transverse marks, irregularly across middle of tylus, dorsal margin of lora, lora except for spot on middle, dorsal margin of bucculae, and genae, orange-red; front and vertex clothed with rather prominent

yellowish hairs. Rostrum, length 2.8 mm., reaching to seventh ventral segment, yellowish, blackish apically.

Antennae: Segment i, length 1.17 mm., pale to yellowish, the slightly enlarged apex and two spots on inner or anterior aspect, reddish to brownish, pubescence and spines yellowish brown; ii, 2.37 mm., rather uniformly yellowish brown; iii, yellowish brown (broken).

Pronotum: Length .97 mm., width at base 1.69 mm.; pale testaceous to brownish with dusky, more brownish laterally on disk; mark each side on collar and extending to margin of callus, and rather broad spot behind inner half of callus, orange; propleura pale, an orange ray across lower half of coxal cleft and extending to near posterior margin; xyphus and lower half of collar pale; disk clothed with rather prominent yellowish to dusky hairs and interspersed with sericeous pale to golden pubescence. Scutellum pale, base with an orange colored vitta each side of median line and frequently extending to join with orange mark at each side of apical half.

Hemelytra: Embolar margins slightly arcuate; pale testaceous to yellowish brown, middle of endocorium and outer half of clavus fusco-brownish, usually invaded by pale irrorations, a moderately large pale area at apex of mesocorium; embolium pale, irregularly marked with reddish orange; cuneus yellowish but hypodermis largely filled with coagulated reddish flecks which also extend along corio-membranal margin; clothed with golden yellowish pubescent hairs, intermixed with sericeous golden pubescence and spots of white tomentum. Membrane fumate or pale brownish, certain areas indistinctly conspurcate with fumate, veins brownish, cubitus paler at apex of larger areole.

Legs: Chiefly pale to yellowish, hind femora fusco-brownish with reddish on apical half, irrorate with small and moderately large pale spots but not forming distinct subapical band; front tibiae with reddish brown annulus at middle and one at middle of basal half, nearly obsolete on intermediate pair; hind tibiae reddish near base, spines yellowish brown; tarsi yellowish, dusky on apex.

Venter: Pale to yellowish, sides largely orange reddish but more or less invaded with pale spots, pale yellowish pubescent; genital claspers distinctive of the species (fig. 142), the long arm of right clasper coming nearest to *tibialis*.

Female: Length 5.9 mm., width 2.4 mm.; very similar to the male, but hemelytra more broadly pale, the clavus yellowish brown with irregular pale areas.

Holotype: Male, 4 July, 1909, Lakehurst, N. J. (Chris. E. Olsen); author's collection. Allotype: same data as the type. Paratypes: Male and females (2), taken with types. NEW YORK—Female, 4-7 July, 1915, Bayshore; Female, 4 July, 1911, Yaphank; female, 21 Aug., 1917, Wyandanch, Long Island (Chris. E. Olsen). Female, 12 July, 1919, Cold Spring Harbor, Long Island (H. M. Parshley). (Named in honor of the collector, Mr. Chris. E. Olsen.)

P. tibialis Reuter.

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 68, 1876.

Length 5.1 mm., width 1.9 mm. Chiefly greenish, pronotal disk with four orange stripes; distinguished by the fuscous line on anterior aspect of antennal segment ii, also by the reddish black line on dorsal margin of anterior and intermediate tibiae. Genital claspers distinctive, right clasper very long and exhibiting a relationship with that of *olseni*.

Breeds among rank growing herbaceous weeds in damp situations.

Branford, 20 July, 1905 (H. W. W.); East River, Aug., 1910 (C. R. E.).

***Phytocoris luteolus** Knight, new species.

Male: Length 5.1 mm., width 1.7 mm. Head: Width .94 mm., vertex .27 mm.; median line of vertex impressed, clothed with prominent yellowish hairs; yellow, above base of antenna, transverse mark at base of front, rather broadly on middle of tylus, juga except apex, and basally on lora, orange to bright red. Rostrum, length 2.29 mm., reaching upon fifth abdominal segment, yellowish, apex blackish.

Antennae: Segment i, length 1.17 mm., pale yellowish, tinged with orange at apex; ii, 2.64 mm., uniformly pale yellowish; iii, 1.44 mm., yellowish; iv, 1.03 mm., yellowish.

Pronotum: Length .77 mm., width at base 1.36 mm.; bright yellow, broad ray behind eye and extending along lateral margin of disk, ray behind dorsal margin of eye and extending to front margin of callus, and small spot behind inner half of callus, orange colored; calli, xyphus, and propleura, more pale than yellowish. Scutellum uniformly bright yellow. Sternum and pleura pale to yellowish, ostiolar peritreme white.

Hemelytra: Embolar margins scarcely arcuate; clothed like the pronotum and scutellum with pale yellowish pubescence; yellow translucent, basal one-third of corium and one-fourth of embolium marked with reddish orange reticulations, several irregular orange spots on outer half of clavus; apex of clavus and inner margins of cuneus with spots of bright red. Membrane pale fumate, larger areole fuscous, apical half conspurcate with fuscous, veins yellowish to fuscous.

Legs: Pale, anterior and middle femora more yellowish; hind femora with apical half or two-thirds of dorsal surface reddish to fusco-reddish, anterior face broadly pale but with red specks, the dark color irrorate with small pale spots, with one or two larger yellowish spots on dorsal surface of apical half; hind tibiae pale but with reddish near base; tips of tarsi fuscous.

Venter: Uniformly yellowish; genital claspers and flagellum distinctive of the species (fig. 143).

Female: One specimen is at hand, June 9, 1917, Auburn, Alabama (H. H. Knight) which apparently belongs here; similar to

the male except that base of cuneus and basal margin of pronotal disk is more broadly red.

Holotype: Male, 4 July, 1920, New Haven, Conn. (B. H. Walden).

P. confluens Reuter.

Phytocoris puella var. *confluens* Reuter, Acta. Soc. Sci. Fenn., xxxvi, No. 2, 20, 1909.

Male: Length 4.6 mm., width 1.43 mm. Head: Width .83 mm., vertex .26 mm.; chiefly bright red, geminate mark on base of tylus, juga and lora apically, and ventral margin of bucculae, pale. Rostrum, length 2.2 mm., reaching upon sixth abdominal segment, pale to yellowish, blackish at apex.



luteolus

FIG. 143. *Phytocoris luteolus* Knight,—male genital claspers, (b') right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.



confluens

FIG. 144. *Phytocoris confluens* Reuter,—male genital claspers, (aa) left clasper, dorsal aspect, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

Antennae: Segment i, length 1 mm., reddish yellow, pubescence and spines pale yellowish; ii, 2.42 mm., uniformly yellowish; iii, .91 mm., yellowish; iv, 1.57 mm., yellowish.

Pronotum: Length .70 mm., width at base 1 mm.; deep reddish, becoming blackish at anterior angles of disk, calli fuscous with red, with pale ray or spots behind each callus, basal margin slenderly pale except at basal angles; propleura deep red, lower margins and xyphus pale; clothed with yellowish to dusky pubescence, disk with yellowish sericeous pubescence intermixed. Scutellum red, basal angles and apex pale, median line scarcely indicated with pale. Sternum and pleura dark red, ostiolar peritreme and ventral margin of epimera, white.

Hemelytra: Red, conspurcate with small to medium sized irrorations, cuneus with pale spots on inner margin and across middle; clothed with yellowish to dusky pubescence, intermixed with yellowish sericeous pubescence which may be white over the pale spots. Membrane uniformly pale fumate, veins red.

Legs: Pale to yellowish, anterior femora more reddish yellow apically, tibiae without annulations; hind femora red, pale at base, rather thickly irrorate with small pale spots although at times

nearly obsolete; hind tibiae with small red marks near base, tips of tarsi fuscous.

Venter: White beneath, latero-dorsal margin deep red, each segment with small spot of red laterally on the white; eighth segment and base of genital segment dark fusco-reddish; genital claspers and flagellum distinctive (fig. 144).

Other specimens which apparently belong to this species have the membrane rather distinctly conspurcate with fuscous. The above description and figures of genitalia are drawn from the type specimen, male, 6 July, 1890, Washington, D. C. (O. Heidemann), United States National Museum collection.

East River, 5 Aug., 1908 (C. R. E.); New Haven, 24 June, 1911 (A. B. C.).

**Phytocoris venustus* Knight, new species.

Male: Length 4.5 mm., width 1.6 mm. Head: Width .86 mm., vertex .28 mm.; orange colored above, spot each side of vertex and one at base, two spots on median line of front, and base of tylus pale; lower half of head pale, base of juga, dorsal margin of lora, and irregular band across middle of tylus, bright red. Rostrum, length 2 mm., reaching upon sixth abdominal segment, yellowish, blackish at apex.

Antennae: Segment i, length .97 mm., pale yellowish, darker at apex, setae pale; ii, .80 mm., uniformly yellowish; iii, 1.34 mm., yellowish; iv, 1.16 mm., yellowish.

Pronotum: Length .68 mm., width at base 1.37 mm.; pale, disk with four orange stripes behind calli, outer stripe continuing around callus to anterior angle and collar, small spot before callus and collar orange red; propleura with red ray across lower half of coxal cleft but not extending to posterior margin; clothed with moderately prominent yellowish pubescent hairs, more prominent laterally and on scutellum and clavus. Scutellum orange-red to deep red, basal angles and median line more or less pale. Sternum and pleura pale, with red on meso- and meta-episternum, ostiolar peritreme white.

Hemelytra: Yellow, clavus and basal half of corium and embolium, red but irrorate with pale yellowish, thus leaving a large triangular area before cuneus nearly clear yellow; embolium sometimes with small red flecks on apical half; cuneus and tip of corium extending beyond cuneal fracture, red, outer margin of cuneus with four yellow spots, sometimes almost confluent. Membrane fumate to pale fuscous, slightly paler on apical half, veins red, usually pale at apex of areoles.

Legs: Pale to yellowish, fore femora with red flecks apically, hind femora reticulately marked with bright red, somewhat broken at middle of apical half by yellowish area; hind tibiae with reddish spots near base.

Venter: Yellowish, with red flecks along dorsal margin; genital claspers and flagellum distinctive of the species (fig. 145).

Female: Length 4.7 mm., width 1.9 mm.; more robust than the male but very similar in coloration.

Holotype: Male, 8 Aug., 1910, East River, Conn. (C. R. Ely); author's collection. *Allotype*; taken with the type. *Paratypes*: Females (4), July-Sept., 1910, type locality (C. R. Ely). DISTRICT OF COLUMBIA—Female, 12 July, 1909, Washington (O. Heidemann). NEW YORK—Female, 10 Sept., 1917, Syracuse (C. J. Drake).

***Phytocoris caryae* Knight, new species.**

Male: Length 5.3 mm., width 1.74 mm. Head: Width .93 mm., vertex .28 mm.; yellow, small spot behind dorsal margin of each eye, irregular large spot each side of front, and spot on dorsal margin or lora, orange colored; front and vertex bearing prominent pale hairs. Rostrum, length 2.2 mm., reaching upon fifth abdominal segment, pale yellowish, brownish black at apex.

Antennae: Segment i, length 1.14 mm., yellow, anterior aspect with small orange spots, largest one just before apex, setae pale to dusky; ii, 2.46 mm., uniformly pale yellow; iii, 1.5 mm., yellow; iv, 1.16 mm., yellow, dusky at apex.

Pronotum: Length .81 mm., width at base 1.44 mm.; greenish yellow, with four orange stripes on disk, sometimes joining basally; calli pale, collar with broad orange spot each side of median line and extending to touch callus; propleura with small orange ray behind lower half of coxal cleft; clothed with pale yellowish pubescent hairs, a few dusky hairs on basal margin.



FIG. 145. *Phytocoris venustus* Knight,—male genital claspers, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.



FIG. 146. *Phytocoris caryae* Knight,—male genital claspers, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

Scutellum greenish yellow, an oblique orange mark each side of median line at middle. Sternum and pleura pale yellowish.

Hemelytra: Embolar margins very slightly arcuate; pale to greenish yellow; mottled with fusco-orange, darkest on clavus and irrorate with large irregular greenish yellow spots, apical one-fifth of corium nearly uniformly greenish yellow, embolium with a few scattering reddish orange spots; tip of clavus with dusky spot and beset with prominent black hairs; cuneus yellowish translucent.

apex and margins flecked with reddish, a prominent fusco-reddish spot on corio-membranal margin; clothed with yellow pubescent hairs, nearly fuscous on ante-apical area of corium. Membrane nearly pale, marmorate with pale fuscous, darkest within areoles and spot on middle, veins dusky yellowish at apex of areoles.

Legs: Pale to yellowish, apical half of femora flecked with bright red, larger spots on posterior pair; tibial spines fuscous, hind pair with small reddish spot at base of spines although obsolete apically; tips of tarsi dusky.

Venter: Pale greenish yellow; genital claspers and flagellum distinctive of the species (fig. 146).

Female: Length 5.2 mm., width 1.9 mm.; more robust than the male but very similar in coloration.

Breeds on *Carya* sp.

Holotype: Male, 30 July, 1916, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: same data as the type. Paratypes: Males and females (24), taken with the types on hickory.

***P. puella* Reuter.**

Ofv. Kongl. Sv. Vet.-Akad. Forh., xxxii, No. 9, 69, 1876.

Female: Length 4.9 mm., width 1.9 mm. Head: Width .86 mm., vertex .36 mm.; pale, mark each side of collum and extending upon collar, irregular arc each side of front, base of lora, and dorsal half of bucculae, orange colored. Rostrum, length 2.26 mm., extending upon fifth ventral segment, pale, blackish at apex.

Antennae: Segment i, length 1.26 mm., pale, indistinctly dotted with orange on anterior aspect; ii, 2.8 mm., pale yellowish; iii, 1.49 mm., yellowish; iv, 1.28 mm., yellowish to dusky.

Pronotum: Length .78 mm., width at base 1.4 mm.; pale, disk with four orange stripes, paler forms with stripes broken at middle, anterior angles with orange stripe which extends upon collar; propleura with orange ray across lower half of coxal cleft and extending to near posterior margin. Scutellum pale, with an oblique orange vitta each side of apical half.

Hemelytra: Pale, rather uniformly reticulate with orange, cuneus with red; pale yellowish pubescent and intermixed with prominent white sericeous pubescence. Membrane pale, areoles infuscated but more conspurcate within apical half, veins yellowish, pale at apex of areoles.

Legs: Pale, front tibiae with two nearly obsolete orange-yellow bands; hind femora reticulately marked with red on apical half but divided at middle of apical half by pale annulus, fuscous hairs arising from the red marks.

Venter: Pale, tinged with red near each spiracle.

Male: Length 5 mm., width 1.54 mm. Suggestive of *confluens* but with the dorsum uniformly bright red, calli pale, basal angles and apex of scutellum yellowish to pale orange; membrane pale

fumate or nearly clear, areoles rather finely and obsoletely conspurcate with pale fuscous; apical half of hind femora reticulate with red and bearing blackish hairs but leaving a yellowish sub-apical band, and in this respect very similar to the female.

This species was described by Reuter (1876) with New York designated as the type locality, the description evidently drawn from the female only. The male here described (fig. 147) has been recognized by association with female specimens which sex seems to occur in greater abundance. The sexes of *puella* exhibit a greater variation in color than do other closely related species herein described.

East River, Aug., 1910 (C. R. E.); New Haven, 4 Aug., 1920 (B. H. W.).



puella

FIG. 147. *Phytocoris puella* Reuter,—male genital claspers, (b) right clasper, lateral aspect, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.



depictus

FIG. 148. *Phytocoris depictus* Knight,—male genital claspers, (b') right clasper, lateral aspect with outline of genital segment added, (c) flagellum. Greatly enlarged. Drawing by Dr. H. H. Knight.

***Phytocoris depictus* Knight, new species.**

Closely related to *puella* but antennal segment i shorter, also differs in coloration.

Male: Length 4.1 mm., width 1.5 mm. Head: Width .78 mm., vertex .27 mm.; marked with orange and red, nearly as in *puella*. Rostrum, length 1.93 mm., reaching upon fifth abdominal segment, yellowish, blackish at apex.

Antennae: Segment i, length .83 mm., thickest near base and tapering to more slender just before apex, yellowish, with a few red dots on anterior aspect, with seven or eight fuscous setae on basal half of dorsal aspect; ii, 1.97 mm., uniformly pale yellowish; iii, .96 mm., yellowish; iv, .97 mm., yellowish.

Pronotum: Length .71 mm., width at base 1.23 mm.; pale testaceous with dusky, calli pale, disk with four orange stripes, collar each side of median line and behind eye orange colored; clothed with pale yellowish pubescent hairs, fuscous near basal margin, and sparsely intermixed with pale sericeous pubescence; propleura with red across lower half of coxal cleft, more diffusely behind it.

Scutellum pale, with orange mark each side of median line and extending obliquely to lateral margin. Sternum pale, episternum with red mark, epimeron chiefly red, ostiolar peritreme white, reddish just above.

Hemelytra: Irregularly marked with red reticulations, produced by the thickly placed and more or less confluent pale irrorations, basal half of corium more nearly fusco-reddish, extreme tip of clavus and spot near inner basal angle of cuneus, black with prominent black hairs; clothed with golden yellow pubescence, central area with a few small spots of sericeous silvery tomentum; cuneus with bright red and irrorate with rather small pale spots. Membrane pale fuscous, areoles and central area with clear spots, veins pale to fuscous.

Legs: Pale to yellowish, apical two-thirds of hind femora with dark red, irrorate with large and small pale irrorations, an irregular incomplete pale band at middle of apical half, with a few blackish hairs arising from the red; spines on hind tibiae pale, with reddish spots at base of each except apically.

Venter: Pale yellowish, reddish dots on sides, base of genital segment fuscous; genital claspers and flagellum distinctive of the species (fig. 148).

Female: Length 5.1 mm., width 1.77 mm.; larger and more robust than the male but very similar in coloration, the dorsum and membrane frequently more broadly pale.

Breeds on *Quercus macrocarpa*.

Holotype. Male, 15 Aug., 1916, Batavia, N. Y. (H. H. Knight); author's collection. Allotype: 11 Aug., 1920, University Farm, St. Paul, Minn. (H. H. Knight). Paratypes: NEW YORK—Male, 10 Aug., females (2), 12 Aug., males (6), 15 Aug., 1916, type locality (H. H. Knight), taken on *Quercus macrocarpa*. Male and female, 24 Aug., 1915, Batavia (H. H. Knight), taken on *Fraxinus pennsylvanica*, one specimen in teneral condition. MINNESOTA—Males and females (34), 5 Aug., males and females (8), 11 Aug., 1920, University Farm, St. Paul (H. H. Knight), on *Quercus macrocarpa*.

Tribe MYRMECORINI.

Key to Genera.

1. Antennal segment i, in length, distinctly greater than width of head; scutellum not conically produced; dorsum with fine short pubescence **Paraxenetus**
- Antennal segment i, in length, scarcely greater than width of vertex; scutellum conically produced; dorsum, especially the pronotum and scutellum, with long erect pilose hairs **Barberiella**

Paraxenetus Reuter.

P. guttulatus (Uhler).

Ent. Amer., iii, p. 150, 1887.

Embolar margins strongly sulcate, or medially coarctate; fusco-grayish and tinged with fulvous; cuneus, veins of membrane, and

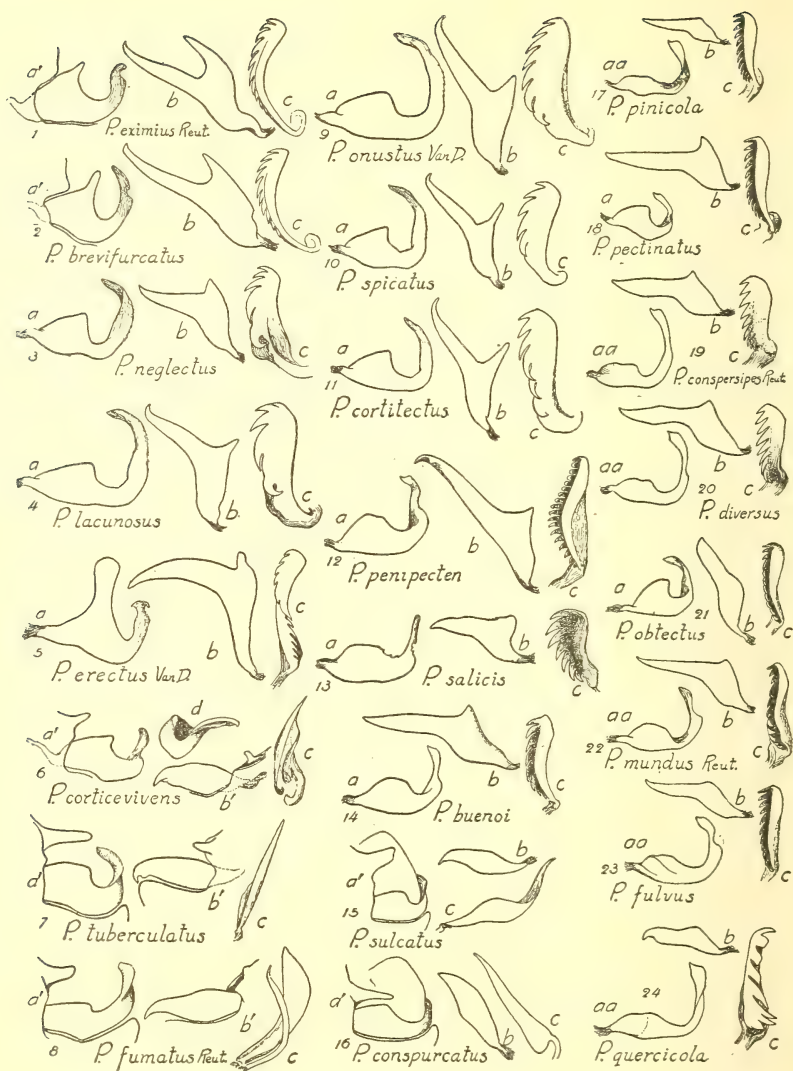


FIG. 149. Male genitalia of species of *Phytocoris*. All greatly enlarged, but drawn to the same scale. Drawing by Dr. H. H. Knight. Key to Structures: (a) left clasper, lateral aspect, (a') left clasper with outline of genital segment added, (aa) left clasper, dorsal aspect, (b) right clasper, lateral aspect, (b') right clasper, lateral aspect, with outline of genital segment added, (c) flagellum, (d) left clasper, caudal aspect. (1) *eximius* Reuter. (2) *brevifurcatus* Knight. (3) *neglectus* Knight. (4) *lacunosus* Knight. (5) *erectus* Van Duzee. (6) *corticevivens* Knight. (7) *tuberculatus* Knight. (8) *fumatus* Reuter. (9) *onustus* Van Duzee. (10) *spicatus* Knight. (11) *cortitectus* Knight. (12) *penipecten* Knight. (13) *salicis* Knight. (14) *buenoi* Knight. (15) *sulcatus* Knight. (16) *conspurcatus* Knight. (17) *pinicola* Knight. (18) *pectinatus*. (19) *tubersipes* Reuter. (20) *diversus* Knight. (21) *obtectus* Knight. (22) *mundus* Reuter. (23) *fulvus* Knight. (24) *quercicola* Knight.

calli, fulvous to reddish, sometimes rather broadly tinged with fulvous; antennae except apical segment, and tibiae, pale yellowish, femora frequently fusco-reddish; clothed with recumbent fine yellowish pubescence, femora rather sparsely set with long pilose hairs, longest on posterior pair.

Male: Length 6.4 mm., width at base of cuneus, 1.33 mm. Head: Width 1 mm., vertex .27 mm., with sulcus on median line of vertex. Antennae: Segment i, length 1.46 mm.; ii, 3.45 mm.; iii, 2.85 mm.; iv, .86 mm.; yellowish, segment iv reddish black.

Female: Very similar to the male in form and coloration, the dorsum sometimes more broadly fulvous or reddish.

Occurs on grape vines (*Vitis* sp.).

Cold Spring Harbor, Long Island, N. Y. 4 Aug., 1902 (H. G. Barber).

Barberiella Poppius.

B. apicalis Knight, new species.

Male: Length 5 mm., width 1.6 mm. Head: Width 1.14 mm., vertex .43 mm.; strongly vertical, vertex and base of front distinctly impressed along median line but not grooved; brownish black, clothed with pale pubescence and short hairs, more prominent on front. Rostrum, length 1.99 mm., reaching upon base of hind coxae, dark brown.

Antennae: Segment i, length .52 mm., dark brown, finely and closely pubescent, with two or three erect hairs near apex but not equal to thickness of segment; ii, 2.03 mm., cylindrical, thickness slightly greater than segment i, more slender near base, dark brown, finely and closely pubescent; iii, 1.11 mm., slender, dark brown; iv, .68 mm., dark brown.

Pronotum: Length 1.24 mm., width at base 1.59 mm., anterior angles .84 mm., apical one-third nearly cylindrical or to a point just behind calli, from thence flaring to basal margin but forming nearly a straight line, disk strongly convex, calli scarcely apparent but with two impressed points just between; brownish black, darker anteriorly, surface alutaceous, pale pubescent and sparsely interspersed with erect pilose hairs. Scutellum conically produced, the point bent over and directed to the rear, sparsely set with long pilose hairs, mesoscutum broadly exposed, sloping downward to base of scutellum from which it is not distinctly separated; dark brown, moderately shining. Sternum and pleura dark brown, posterior half of epimeron white, ostiolar peritreme dark brown, with a protuberant point just above the ostiole.

Hemelytra: Embolar margins strongly constricted at middle, disk nearly flat, cuneus strongly declivitous; clothed with moderately sparse golden yellow pubescence and interspersed with more erect fine hairs, more prominent on clavus; clavus dull fusco-brownish, a triangular pruinose field extending upon middle from

the corium; corium fuscous on basal half, a tranverse pale spot at middle, behind this dark fusco-brownish as far as a line drawn transversely through tip of clavus, apical area pale brownish, somewhat translucent and shining, more pruinose bordering the tranverse dark band; cuneus uniformly brownish translucent. Membrane uniformly fusco-brownish, veins slightly darker.

Legs: Uniformly dark brown, hind coxae with a pale or yellowish opaque spot on antero-lateral angle; femora coarsely alutaceous, sparsely clothed with erect pale hairs; hind tibiae compressed, strongly curved, beset with yellow spine-like hairs; tarsi fuscous, brownish at base.

Venter: Black with a tinge of brown, moderately shining; strongly constricted at base, a pale mark on side just beneath that of corium; ventral aspect sparsely set with erect pale hairs.

Female: Length 5.5 mm., width before base of cuneus 1.59 mm.; very similar to the male in form and coloration, abdomen broader apically. Head: Width 1.32 mm., vertex .58 mm. Antennae: Segment i, length .54 mm.; ii, 2.1 mm., slender on basal half, clavate apically (.114 mm. thick), exceeding thickness of segment i.

Holotype: Male, 14 July, 1906, Staten Island, N. Y. (Wm. T. Davis); author's collection. Allotype: Female, Aug., Central Park, Long Island, N. Y. (Wm. T. Davis).

This species is more closely related to *Fiebrigiella silvestri* Popp., described from Brazil, than to *Barberiella formicoides* Popp., but differs from the former at least in the longer antennal segment i and by the shining, brownish translucent apical area of corium and embolium. The members of this genus are very good ant mimics, and in general aspect very suggestive of large species of *Pilophorus*.

Family GERRIDAE.*

By J. R. DE LA TORRE-BUENO.

The water striders are familiar objects on the surface of ponds and streams, gliding about on their long spider-like legs like graceful skaters on a sheet of ice. They form perhaps one of the largest of the families of semiaquatic Heteroptera. They differ, as the key has shown, from all other Heteroptera in having sub-apical claws; that is, inserted in more or less of a cleft at some distance from the apex of the last tarsal segment.

The divisions of the family are shown in the following key to tribes of Gerridae.

* This family should follow the Veliidae but in paging the manuscript it was inadvertently placed after Miridae. The Miridae was nearly all in page form before the error was noticed, and to correct it, meant changing several hundred pages and figure numbers, to say nothing of recasting the pages of the Miridae. W. E. B.

and the eggs by *Limnodites gerriphagus*, a minute aquatic hymenopteron. The species is rarely found fully winged.

New Haven, 21 Oct., 1903 (H. L. V.); 18 March, 1911 (B. H. W.); Torrington, 7 July, 1905 (W. E. B.); Cheshire, 6 May, Orange, 21 May, Hamden, 28 May, 1911; Portland, 15 Aug., 1913 (B. H. W.); Farmington, 24 May, 1914 (W. M.); Winnipauk, 4 Aug., 1908 (C. W. J.).

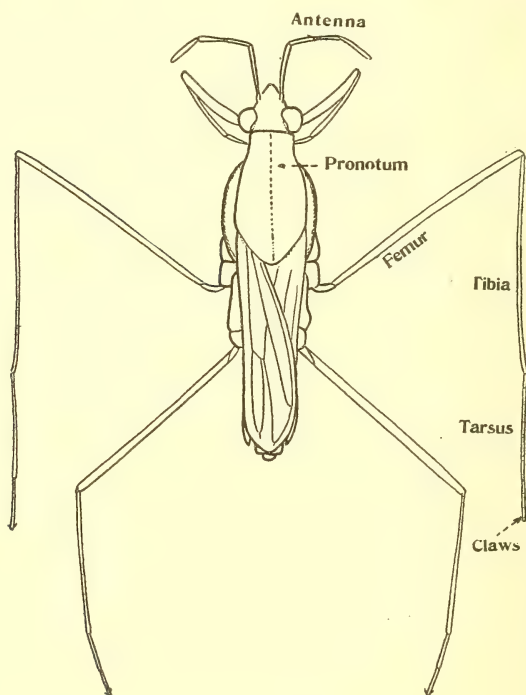


FIG. 150. *Gerris buenoi* Kirkaldy,—dorsal view. Greatly enlarged. Drawing by Dr. Philip Garman.

G. (Aquarius) conformis (Uhler). (Pl. xvi, 9.)

Proc. Bost. Soc. Nat. Hist. xix, 435, 1878.

This form is less abundant, but is always found fully winged. It ranges south along the Atlantic seaboard.

Orange, 21 May, Hamden, 1 June, 1911 (B. H. W.); Hartford, 14 May, 1914 (W. M.).

Key to Species.

(*Gerris* S. Str.)

- | | |
|---|----------------------|
| 1. Sixth abdominal segment with rather small and short spines; stoutish species, mostly winged | 2 |
| Sixth abdominal segment produced into a long, acute spine; a comparatively long and slender species | <i>canaliculatus</i> |

2. Antero-lateral margin of pronotum with a lighter stripe 3
 Antero-lateral margin of pronotum concolorous; second emargination of sixth abdominal segment in male, narrow and rounded; female genital segment comparatively narrow; connexivum flavous **marginatus**
3. Second emargination of sixth abdominal segment in male broadly rectangular; bases of hemelytra dark **buenoi**
 Second emargination of sixth abdominal segment in male narrow, semicircular; bases of hemelytra white-marked **argenticollis**

G. (Gerris) marginatus Say. (Pl. xvi, 11.)

Het. New Harm., 36, 1832; Compl. Writings, i, 362, 1859.

This small stout form is an abundant inhabitant of our lakes and ponds, where it preys on other insects. This, too, has five nymphal stages and a life cycle of from five to six weeks. It ranges over the whole United States, and in Connecticut has been taken as follows:

West Stratford, 16 Aug., 1904; Putnam, 12 July, 1905 (H. L. V.); Orange, 13 Apr., Hamden, 24 Apr., 28 May, Cheshire, 6 May, New Haven, 4 May, 1911 (B. H. W.); Lyme, 14 May, 1911 (A. B. C.); So. Meriden, 26 Apr., 1914 (H. L. J.).

G. (Gerris) buenoi Kirkaldy. (Figs. 150 and 151.)

Ent. News, xxii, 246, 1911.

This small species, shown in figures 150 and 151, has frequently been confounded with the preceding. It ranges from British Columbia as far as New Jersey at least. In Connecticut it is recorded as follows:

Milford, 10 Aug., 1905 (W. E. B.); New Haven, 14 Apr., 4 May, 1911; Cheshire, 6 May, 1911 (B. H. W.); Hamden, 18 May, 1919 (M. P. Z.); Litchfield, 26 July, 1901 (L. B. W.).

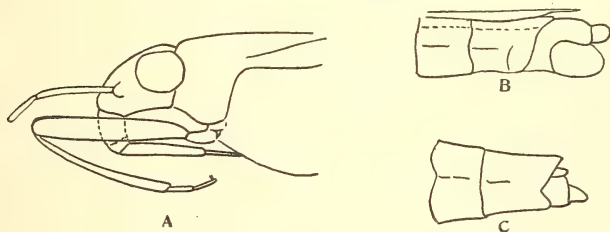


FIG. 151. *Gerris buenoi* Kirkaldy,—(a) lateral view of head, (b) male genitalia, (c) female genitalia. All greatly enlarged. Drawing by Dr. Philip Garman.

G. (Gerris) argenticollis Parshley.

Ent. News, xxvii, 103, 1916.

This species is recorded by the author from Massachusetts and North Carolina.

G. (Gerris) canaliculatus Say.

Het. New Harm., 36, 1832; Compl. Writings, i, 363, 1859.

This form is rather rare in the North, where it frequents still ponds sheltered in secluded little coves and bays. Like all the others, it has five nymphal stages.

Hamden, 24 Oct., 1910; New Haven, 4 May, 1911 (B. H. W.).

As the subgenera *Limnogonus* (*hesione*) and *Limnoporus* (*rufoscutellatus*) have each but the one indicated species in our territory, they are easily separated by the preceding table.

G. (Limnoporus) rufoscutellatus Latreille. (Pl. xvi, 10.)

Gen. Crust. Ins., iii, 134, 1807.

This universal Gerrid, of whose habits little is known, is a dweller in still waters. It is rarely found wingless. In the East it occurs as far south as North Carolina; it is also found in the West and in Northern Europe and Asia.

New Haven, 28 Apr., 4, 15 May, 1911 (B. H. W.); Cornwall, 10 Aug., 1918 (B. H. W.).

G. (Limnogonus) hesione Kirkaldy.

The Entomologist, xxxv, 137, 1902.

This species has been taken in abundance in Ohio and it may finally be found in Connecticut.

Tribe **HALOBATINI.***Key to Genera.*

1. First antennal joint much shorter than the other three taken together, not much longer than the second and third taken together, and sometimes shorter 2
 First antennal joint nearly equal to the remaining three taken together, much longer than the second and third taken together, almost as long as the entire body; hind femora twice as long as hind tibiae **Metrobates**, p. 662
2. Apical joint of antennae (fourth) longer than third 3
 Apical joint of antennae (fourth) never more than equal to third; basal joint of anterior tarsi much shorter than second; hind femora equal to or much shorter than hind tibia and tarsus taken together **Rheumatobates**, p. 663
3. Eyes large, fairly prominent; colors black and yellow; lacustrine species **Trepobates**, p. 663
 Eyes small, widely separated; plumbeous forms, entirely sericeous; oceanic species **Halobates**, p. 663

Metrobates Uhler.**M. hesperius** Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 109, 1871: xix, 438, 1878.

A lacustrine species which congregates in large patches of blackness on the smooth waters of our lakes. It is very active and skips and jumps about. Found from Canada to North Carolina. It is found both winged and wingless.

Portland, 15 Aug., 1913 (B. H. W.).

Trepobates Uhler.**T. pictus** (Herrich-Schaeffer).

Wanz. Ins. viii: 111, figs. 882, 883, 1848.

This bright-colored little species is another lake-dweller. In this latitude it is commonly found wingless, although now and again a fully-winged individual may be found. This also has five nymphal instars. It ranges from Canada to Central America.

Rheumatobates Bergroth.

(Key to males only.)

Hind femora and coxae curiously swollen and distorted **rileyi**
Hind femora and coxae simple **tenuipes**

(Key to both sexes.)

Mesosternum yellow, unicolorous **rileyi**
Mesosternum yellow with anterior margin and the two posterior
diverging bands brownish black, not reaching the posterior margin
and dilated near the anterior margin **tenuipes**

R. rileyi Bergroth.

Ins. Life iv, 198, 321, 1892.

R. rileyi is one of the lacustrine water-striders, although it may occasionally be found on bays in streams. It lies very low in the water.

R. tenuipes Meinert.

Ent. Medd. v, 7, 1895.

These two species are among the most peculiar of the water striders, on account of the antennal structure of the male. The distribution as published is unconvincing. Both should be found in Connecticut.

Halobates Eschscholtz.**H. micans** Eschscholtz.

Nat. Abt. Dorpat, 1, 163, 1823.

This oceanic species has been found stranded on beaches as far north as South Carolina, but is hardly likely to be seen on the Sound shores of Connecticut.

Family HYDROMETRIDAE.*

By J. R. DE LA TORRE-BUENO.

There is only one genus in this family.

* This should precede the Miridae; see footnote on page 658.

Hydrometra Latreille.*(Limnobates Burmeister.)*

It contains only one species in the Northeastern United States.

H. martini Kirkaldy. (Fig. 152.)

Entom. xxxiii, 175, 1900.

(*H. lineata* Say, Descr. Het. Hem., 35, 1832.)

This linear form (fig. 152) is common in the marshes about the East, or in still coves in placid ponds. It is carnivorous, like every

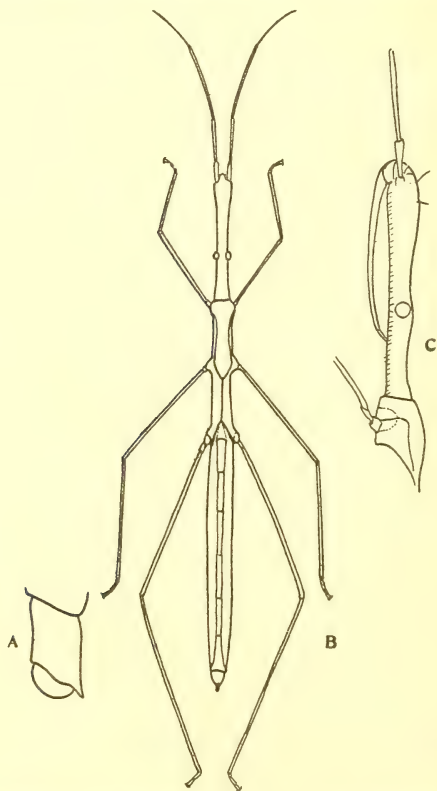


FIG. 152. *Hydrometra martini* Kirkaldy,—(a) male genitalia, (b) dorsal view of insect, (c) side view of head. All greatly enlarged. Drawing by Dr. Philip Garman.

other water bug known to the writer, and feasts on dying, dead and decayed insects in the water.¹ It will also attack struggling

¹ Hungerford finds that it captures Entomostraca in the water with its long rostral stylets.

living ones in force if necessary. Its eggs are fascinating in structure; long and spindle-formed, the chorion is coarsely reticulated, and the eggs themselves are fastened end on by a sort of pedicel to any convenient place. The period of emergence varies between nine and nineteen days according to temperature. There are five nymphal stages in about fifteen days, or say about twenty-five to thirty-five days for the life-cycle, allowing for three to five broods in the course of a summer.

This species has been recorded from Ontario, Canada, to Mexico.

Family TERMATOPHYLIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family includes a few small species, resembling the Miridae in some respects. The head is horizontal, truncate at apex; antennae four segmented, the second segment often enlarged, rostrum four segmented; the first segment short, scarcely longer than thick, extending at most to middle of eyes. Hemelytra consisting of corium, clavus, embolium, cuneus, and membrane, the latter with one large cell. Hind wings without hamus. Tarsi three segmented, without arolia. Genitalia much as in the Anthocoridae. One genus occurs in North America.

Hesperophylum Reuter and Poppius.

A single species is known.

H. heidemanni Reuter and Poppius.

Ofv. Finska Vet. Soc. Forh., liv, Afd. A., 17, 1912.

Black; pronotum at base and hemelytra dark brown, scutellum yellowish white, darker at apex, membrane smoky brown with lateral light spots; third and fourth antennal segments, rostrum in part, and the tibiae yellowish white.

Vertex, in female, not quite twice as wide as an eye. Second antennal segment about five times as long as the first, somewhat longer than the pronotum; the fourth about as long as the first, somewhat longer than the third. Length 4 mm.

This species was described from a single female specimen taken on Mount Washington, New Hampshire, and has not since been found in New England.

Family ANTHOCORIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family includes a moderate number of small and inconspicuous forms living in flowers, under bark, in houses, in birds' nests, etc.; many are known to be of predaceous habit. Form flattened, ovate; head long, horizontal; ocelli present; bucculae lacking. Hemelytra, when present, with distinct embolium and

cuneus. The male has a single asymmetrical genital plate; the female a narrow median plate with larger triangular ones on each side.

Key to Subfamilies.

- Third and fourth antennal segments slender, linear, with long hairs
LYCTOCORINAE
 Third and fourth segments fusiform, with short hairs ..ANTHOCORINAE

Subfamily LYCTOCORINAE.

One genus is represented in the New England material at hand, but several others will probably be found to occur here and are included in the generic key. The species of this group are comparatively rare, and being inconspicuous in appearance and retiring in habits, they are easily overlooked.

Key to Genera.

1. Channel of metasternal orifices curved forward, or backward, with rounded angle, fine carina lacking 2
 Channel of metasternal orifices nearly straight, joining at a sharp right angle a very fine carina which extends to anterior pleural margin **Lyctocoris**
2. Channel curved forward; pronotal margins not distinctly ciliate 3
 Channel curved backward toward apex; pronotal margins ciliate
Lasiochilus
3. Channel long, curved at middle, and almost or quite reaching margin of metapleura **Xylocoris**
 Channel shorter, curved near apex, not nearly reaching margin of metapleura **Asthenidea**

Xylocoris Dufour.

Small shining species, having the lateral pronotal margins straight; apical collar very slightly developed; apex of abdomen with long setae; orificial channel curved forward from middle, extending almost or quite to anterior margin of metapleura; front femora somewhat incrassate, unarmed. A single dimorphic species occurs within our limits.

X. cursitans (Fallén).

Mon. Cimic, Suec., 74, 1807.

Brownish black, shining; antennae piceous; rostrum, tibiae and tarsi yellowish or reddish brown; hemielytra, in the long-winged form, yellowish brown, clavus interiorly and lateral margins darker and more shining; membrane white; in the short-winged, uniform yellowish brown. Hemielytra, in long-winged form, extending to apex of abdomen, in short-winged, extending at most to base of fourth abdominal segment. Length 2.25-2.5 mm.

New Haven, 24 Nov., 1910 (A. B. C.); North Haven, 20 Sept., 1918 (M. P. Z.); Woodmont, 6 Sept., 1910 (B. H. W.).

Subfamily ANTHOCORINAE.

Key to Genera.

1. Pronotum trapezoidal, its outline not continuous with that of head; membrane with three or four veins 2
Pronotum conical, becoming cylindrical anteriorly and forming a continuous outline with the elongate head; membrane with one vein *Macrotracheliella*, p. 667
 2. Collar of pronotum distinct; membrane with four veins 3
Collar obsolete; membrane with three veins *Triphleps*, p. 668
 3. Sides of pronotum not explanate; corium not or obsoletely punctate; metasternal canals not elevated at lateral ends
Anthocoris, p. 667
- Sides of pronotum explanate, extending anteriorly more or less beyond base of collar; corium distinctly punctate; canals prominent laterally *Tetraphleps*, p. 667

Macrotracheliella Champion.

This genus includes two species, one from Central America and one from New England.

M. nigra Parshley.

Ent. News, xxviii, 38, 1917.

Shining black, the third antennal segment narrowly yellow at base. First antennal segment not quite reaching apex of head; second about twice the length of the first. Length 2.5 mm.

This species has been taken in Massachusetts and Rhode Island, but not as yet in Connecticut.

Anthocoris Fallén.

Species of comparatively large size, having the head longer than wide among eyes and usually four membranous veins, the inner sometimes obsolete. Only one species occurs in New England.

A. borealis Dallas.

List of Hemip., ii, 588, 1852.

Shining black, clavus exteriorly and corium anteriorly pale; veins all present but not strongly developed. Length 3.5-3.7 mm.

Often taken in sweeping. It is probable that Say's description of *Reduvius musculus* pertains to this species. It certainly occurs in Connecticut, but no records are at hand.

Tetraphleps Fieber.

Parshley, Can. Ent., lii, 83, 1920.

This genus has recently been found to occur in North America. It is readily distinguished from *Anthocoris* by the explanate sides of the pronotum, which project anteriorly a little beyond the base of the collar.

Key to Species.

1. Dark brown; second antennal segment in length equal to width of head including eyes*americana*
Uniform light brown; second antennal segment longer*uniformis*

T. americana Parshley.

Can. Ent., lii, 84, 1920.

Dark brown, the hemielytra variegated with light and dark markings. Length 3.3-3.7 mm.

Known to occur in Maine and Ottawa.

T. uniformis Parshley.

Can. Ent., lii, 85, 1920.

Pale uniform brown; antennae long and slender. Length 3.7 mm.

Known from a single specimen taken on Mount Washington, New Hampshire, by Mrs. A. T. Slosson.

Triphleps Fieber.

A single minute species occurs in our territory.

T. insidiosa (Say).

Het. New Harm., 32, 1832.

Very dark brown to black; antennae, except first segment, femora at apex, tibiae except the posterior, pale yellowish brown; hemielytra yellowish, translucent, cuneus, extreme apex of corium, and basal half of clavus, blackish brown. Length 1.75-2 mm.

This minute species is very commonly met with in sweeping, as it lives in large numbers in the flowers of various plants, where it destroys such insects as it can overpower, aphids, young scale insects, etc. According to Garman and Jewett (1914) it frequents young corn ears, where it feeds on the eggs of the corn ear worm and deposits its own in the strands of corn silk. Hyslop (1916) presents evidence that the injuries made in oviposition furnish a mode of entrance for the destructive disease known as corn ear rot. If this proves to be generally the case, it will more than offset the beneficial activities of the insect.

A form having the clavus entirely black pertains to the variety *tristicolor* Buchanan White. It is found throughout the range of the species.

New Haven, 16 Oct., 1903 (H. L. V.), 18 Oct., 1911 (W. E. B.), 7 Aug., 1914 (M. P. Z.); Branford, 27 June, 1904 (H. L. V.), 20 and 28 July, 1905 (H. W. W.); West Haven, 27 June, 1905 (H. L. V.); Rowayton, 5 Aug., 1909 (C. W. J.); Brookfield, 27 July, 1910 (E. L. D.); Glastonbury, 13 July, 1913 (L. B. R.); Hamden, 19 June, 1914 (M. P. Z.).

Family CIMICIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family includes a few flat, broadly oval species of moderate size, notable for being exclusively parasitic on birds and mammals.

The tylus is large, parallel-sided, and produced far beyond the base of the antennae; rostrum short, three segmented; antennae rather long, four segmented; pronotum broadest before the middle; hemielytra reduced to short scale-like condition; tarsi three segmented; ocelli absent. One of the two subfamilies is represented in our fauna.

Subfamily CIMICINAE.

This group includes the greater part of the family. The rostrum does not extend beyond the front coxae, and the large bristles of the genitalia and thoracic margins are broad, curved and more or less serrate on convex side.

Key to Genera.

Pubescence of body very short, except along pronotal and hemielytral margins; anterior pronotal margin very deeply concave **Cimex**
 Pubescence long and sericeous; anterior margin of pronotum shallowly concave, nearly straight at middle **Oeciacus**

Cimex Linnaeus.

Species of moderate size with very fine surface pubescence.

Key to Species.

Fringing hairs of pronotal margin shorter than width of eye; hemielytral commissure shorter than scutellum **lectularius**
 Fringing hairs longer than width of eye; commissure longer than scutellum **pilosellus**

C. lectularius Linnaeus. Common bed-bug. (Pl. xvi, 32.)

Syst. Nat., Edn. 10, 441, 1758.

Brown, with reddish or yellowish tinge; hemielytra reduced to a single short plate, hind margin nearly straight, the inner apical angles broadly rounded, the suture or commissure shorter than the scutellum. Length, 5-6 mm.

This species, the bed-bug, is found throughout the world, having been carried on ships, where it is as much at home as in houses. Owing to the annoyance of its attacks upon man and the danger that diseases may be transmitted by its bites, this insect has received much attention from early times. An account with practical advice for extermination is given by Marlatt (1916).

Hartford, 13 Aug., 1891 (A. P. M.); New Haven, 1906 (B. H. W.), 28 Oct., 1916 (Q. S. L.); North Haven, 16 Oct., 1908 (B. H. W.); Danbury, 20 June, 1919 (G. M. Coddington); Wallingford, 18 June, 1912 (D. J. C.); Highwood, 28 March, 1915 (M. P. Z.).

C. pilosellus (Horváth).

Ent. Mon. Mag., xxi, 12, 1910.

Hind margin of hemielytra nearly straight, the inner angles scarcely, the outer broadly, rounded; scutellum shorter than the hemielytral suture. Length 3.75-4.25 mm. This species lives on bats; it has been found in Massachusetts.

Oeciacus Stål.

The species of this genus are clothed with long dense pubescence; they live in the nests of certain birds. One species occurs in North America.

O. vicarius (Horváth).

Ann. Mus. Natl. Hung., x, 261, 1912.

Pale yellowish brown, with darker markings. Length 3.6-4.5 mm.

This species lives in the nests of chimney swifts, and is probably much more common than would be supposed from the scarcity of examples in collections.

Mount Carmel, 29 May, 1903 (L. L. Dickerman).

Family NABIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This group includes a moderate number of species of medium size, predaceous in habits and usually found wandering over vege-

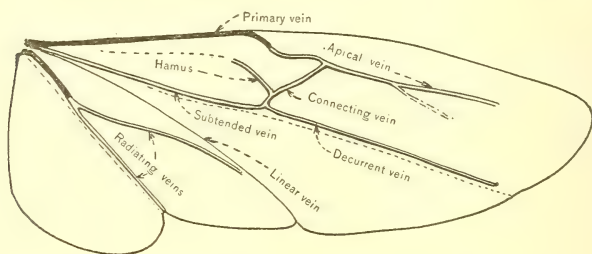


FIG. 153. *Nabis ferus* Linnaeus,—hind wing showing names of veins. Greatly enlarged. Drawing by Dr. Philip Garman.

tation in general, although a few species seem to prefer particular situations such as are afforded by marshy or mountainous regions. Antennae slender, four segmented (in the exotic Pachynominae five segmented), often with a supplementary ring segment at base of second, which may be scarcely visible or half as long as first; ocelli present; rostrum four segmented (or very rarely three segmented), the first very short; species often dimorphic with regard to wing length; fully developed hemielytra consisting of corium, clavus and membrane, and sometimes embolium; membrane large, with elongate cells from which radiate numerous short veins; in the male there is a large genital segment bearing copulatory hooks on each side, in the female the genital segments are longitudinally divided beneath, the ovipositor visible.

Key to Subfamilies.

- Pronotum with anterior transverse impression very close to front margin, or lacking; apical collar none or very narrow; clavus not or scarcely widened posteriorlyPROSTEMMINAE
 Pronotum with anterior transverse impression more distant from front margin; apical collar wide; clavus widened posteriorly ..
 NABINAE

Subfamily PROSTEMMINAE.

Species having eyes contiguous with pronotal margin; claval commissure shorter than scutellum; embolium present; front tibiae with very distinct spongy fossa. One genus occurs in our region.

Pagasa Stål.

Shining species of oblong, anteriorly narrowed form, with sparse erect pubescence; membrane, when developed, with three elongate cells. One species occurs in our fauna.

P. fusca (Stein).

Berl. Ent. Zeit., i, 90, 1857.

Black; antennae and membrane dark brown; rostrum and legs yellow to dark brown, femora paler at apex, surface shining. Length 6-6.5 mm. Usually found under stones.

Lyme, 20 Aug., 1910 (A. B. C.); New Canaan, 23 Sept., 1910, winged form (W. E. B.).

Subfamily NABINAE.

This group contains most of our species; eyes distant from pronotal margin; rostrum slender; pronotum with a broad apical collar, clavus widened posteriorly, the commissure much longer than scutellum; spongy fossa of front tibiae rudimentary. One tribe is represented within our limits.

Tribe NABINI.

This group includes all but one of the North American species of the subfamily.

Key to Genera.

- First antennal segment not longer than head; membrane generally with three elongate discal cellsNabis
 First antennal segment twice as long as head; membrane without closed discal cellsMetatropiphorus

Nabis Latreille.

Numerous species of brownish or rarely shining black coloration; pronotum conical in general shape, moderately constricted at or behind middle; membrane when developed, generally with three elongate discal cells from which short veins radiate toward margins; front femora usually without spines; the species are often dimorphic or polymorphic, the hemielytra more or less reduced,

often extremely short, with membrane very narrow and veinless, or absent. In the male, the genital segment is large and thick, bearing on each side a copulatory hook of form varying with the species. (Fig. 153.)

Key to Subgenera and Species.

1. Body in large part shining black; head distinctly and obliquely narrowed behind eyes; front femora without spines; wing cell with hamus arising from origin of decurrent vein (Subgenus *Nabicula* Kirby); length 9-10.5 mm. **subcoleopratus**
 Body wholly or in large part pallid or brown; head parallel or nearly so behind eyes 2
2. Front femora with minute spines below; wing cell with hamus; connexivum more or less distinctly spotted; femora spotted, annulate at apex; tibiae annulate (Subg. *Hoplistoscelis* Reuter); length 6.4-7 mm. **sordidus**
 Front femora without spines; connexivum usually not spotted ... 3
3. Femora with a subapical dark ring; wing cell without hamus; hind lobe of pronotum distinctly punctate (Subgenus *Lasiomerus* Reuter); length 8-9.5 mm. **annulatus**
 Femora without ring; wing cell with hamus; hind lobe of pronotum almost or quite impunctate 4
4. Form elongate; short-winged forms with hemielytra less than three times length of scutellum; first antennal segment generally about as long as head; hamus arising very near or at origin of decurrent vein; long-winged forms extremely rare (Subgenus *Dolichonabis* Reuter) 5
 Form broader, more or less ovate; short-winged forms usually with much longer hemielytra; first antennal segment generally shorter than head; hamus arising from the connecting vein; long-winged forms common as a rule (Subgenus *Nabis* Latreille) 6
5. Form very narrow; head about five times longer than wide between eyes; hemielytra in short-winged form rounded at apex, membrane lacking; length 9-12.5 mm. **propinquus**
 Form broader; head about three times longer than wide between eyes; shortened hemielytra truncate at apex, membrane present; length 7.5-8.75 mm. **limbatus**
6. Hemielytra in long-winged form without three brown dots; undeveloped hemielytra much shorter than abdomen; dorsal surface of abdomen dark brown, margin of connexivum and single or double median stripe pale; length 8-9 mm. **flavomarginatus**
 Hemielytra in long-winged form with three brown dots, one on disk of corium, two on membranous suture; undeveloped hemielytra about as long as abdomen; dorsal surface of abdomen without median stripes 7
7. First antennal segment very slightly longer than anteocular portion of head; dorsal surface of abdomen black; tibiae with black dots; copulatory hooks of male with large semicircular short-pointed blade and short stem (*vide* Reuter) **inscriptus**
 First antennal segment much longer than anteocular portion of head 8
8. Color gray; form narrow; markings of posterior surface of front and middle femora tending to become a transverse striping; tibiae immaculate 9
 Color reddish to dark brown; form broader; femora conspicuously spotted, less tendency to striping 10
9. Anterior femora extending beyond apex of head; copulatory hooks of male with large semicircular blade and stem broadened basally; length 6.5-8.5 mm. **ferus**

Anterior femora not reaching apex of head; copulatory hooks with small elongated blade and broad arcuate stem; length 6-6.5 mm.

- (recently introduced from Europe) **brevis**
 10. Posterior tibiae dotted; color dark brown; membrane in short-winged form with closed cells; hooks with small triangular blade and long, broad, undulated stem; length 6.5-8.5 mm. **roseipennis**
 Posterior tibiae immaculate; color pale reddish brown; membrane in short-winged form without closed cells; hooks with large, semicircular long-pointed blade and short stem; length 5.6-7 mm. **rufusculus**

N. (Nabicula) subcoleoptratus Kirby.

Richardson's Fauna Bor. Am., iv, 281, 1837.

Readily distinguished by its shining black coloration. Taken in sweeping vegetation. The long-winged form is very rare.

Salisbury, 29 Aug., 1904 (W. E. B.); Litchfield, 29 June, 1913 (L. B. W.); Cornwall, 18 July, 1921 (B. H. W.).

N. (Hoplistoscelis) sordidus Reuter.

Ofv. Vet. Akad. Forh., xxix, 85, 1872.

A rather rare species of wide distribution.

Middlebury, 16 June, 1911 (B. H. W.); New Haven, 24 June, 1911 (A. B. C.); Guilford, 3 July, 1921 (B. H. W.).

N. (Lasiomerus) annulatus Reuter.

Ofv. Vet. Akad. Forh., xxix, 86, 1872.

A rare species taken in sweeping and beating, especially on trees and bushes.

Portland, 7, 14 Aug., 1913, 24 July, 1921 (B. H. W.); Hamden, 25 Sept., 1921 (B. H. W.).

N. (Dolichonabis) propinquus Reuter.

Ofv. Vet. Akad. Forh., xxix, 87, 1872.

A very elongate species found on carices and other plants growing in very damp situations. The long-winged form is extremely rare. It has been found in Maine and Massachusetts, but not as yet in Connecticut.

N. (D.) limbatus Dahlbom.

Kong. Vet. Akad. Handl., 227, 1850.

This palaearctic species has been found in northern New England. It is rare and local and occurs in both long- and short-winged forms.

N. (Nabis) flavomarginatus Scholtz.

Arb. Schles. Ges. Vat. Kultur, 114, 1846.

Another palaearctic species found in the north.

N. (N.) ferus Linnaeus. (Pl. xvi, 33.) (Fig. 153.)

Syst. Nat., Edn. 10, i, 449, 1758.

The commonest species of the genus, found everywhere throughout the season.

N. Windham, 14 July, 1894 (A. P. M.); New Haven, 20 and 28 June, 1902 (E. J. S. M.), 31 Oct., 1903 (E. J. S. M.), 21 Oct., 1903 (H. L. V.), 20 July, 1904 (B. H. W.), 14 Sept., 1912 (H. B. K.); Woodmont, 9 July,

1904 (P. L. B.); Branford, 27 June, 1904 (H. L. V.); Cheshire, 8 July, 1904 (H. L. V.); Hartford, 19 Oct., 1904 (W. E. B.), 7 May, 1914 (W. M.); Windsor, 18 July, 1904 (B. H. W.); Lyme, 4 Dec., 1910 (A. B. C.); Portland, 31 May, 1915 (F. W. Haasis); Yalesville, 25 June, 1917 (M. P. Z.); Suffield, 21 May, 1917 (M. P. Z.); Cornwall, 28 Nov., 1919 (K. F. C.).

N. (N.) roseipennis Reuter.

Ofv. Vet. Akad. Forh., xxix, 89, 1872.

Commonly taken in sweeping; long- and short-winged forms are frequently met with, the latter having hemielytra which are about as long as the abdomen.

Branford, 17 July, 1905 (H. W. W.); Milford, 12 June, 1918 (M. P. Z.); Colebrook, 19 June, 1920 (P. G.); Cornwall, 25 May, 1920 (K. F. C.); North Haven, 4 Sept., 1921 (B. H. W.); Killingworth, 27 June, 1920 (W. E. B.); Danbury, 15 June, 1909 (C. W. J.); So. Meriden, 6 May, 1915 (H. L. J.); Litchfield, 9 March, 1913 (L. B. W.); Winnipauk, 16 June, 1909 (C. W. J.).

N. (N.) rufusculus Reuter.

Ofv. Vet. Akad. Forh., xxix, 92, 1872.

A common pale yellowish or reddish brown species, which is rarely found in the long-winged condition.

So. Kent, 20 Aug., 1894 (A. P. M.); Danbury, 15 June, 1909 (C. W. J.); Litchfield, 7 May, 1915 (L. B. W.); North Branford, 5 July, 1921 (P. G.); Salisbury, 20 Aug., 1921 (P. G.); Hamden, 11 June, 1921 (B. H. W.); Portland, 31 May, 1915 (F. W. Haasis); Suffield, 21 May, 1917 (M. P. Z.).

N. (N.) inscriptus Kirby.

Richardson's Fauna Bor. Am., iv, 280, pl. 6, fig. 7, 1837.

This species remains uncertain and I have seen no specimens which agree with Reuter's redescription.

Metatropiphorus Reuter.

This genus contains a single species of elongate form. It has the first antennal segment about twice as long as the head; second rostral segment much longer than the third; pronotum strongly constricted behind middle; membrane with several veins, mostly simple, not forming discal cells.

M. belfragii Reuter.

Ofv. Vet. Akad. Forh., xxix, 93, 1872.

A slender grayish brown species, with darker markings and brown apical bands on femora and tibiae. It has been found very rarely, in Massachusetts and New York. Length 6.5-7 mm.

Family MESOVELIIDAE.

By J. R. DE LA TORRE-BUENO.

There are only two genera in this family. *Mesovelis* is world-wide in distribution. The other is Papuan.

Mesovelia Mulsant and Rey.

(Fieberia Jakovlev.)

There seems to be only one species in this genus with us.

M. bisignata Uhler.

Stand. Nat. Hist. ii, 274, f. 324, 1883.

This species is said to be the same as *M. mulsanti* F. B. White (Trans. Ent. Soc. Lond. 268, 1879), but thus far, I have not succeeded in convincing myself that this is a fact. *Mesovelias*, like all coons, look alike, and in the absence of specimens from Brazil, I prefer to let Uhler's name stand for the present.

This species is very common and abundant on duckweed, where the green-bodied, wingless form pursues its prey and brings up interesting families. The winged form is not common, and ranges from the fully-winged to the apterous by any number of gradations, so it has practically an infinity of forms between the two extremes.

Admitting the identity of the two names, the species extends throughout the United States down into Brazil, and some claim into India. Be this as it may, this bug has five molts and an egg state, and there are several broods a year. Results in breeding this are not quite ready for publication,* but they indicate decidedly that this is not a true Gerrid, nor even closely related to that group. It is, in fact, a land bug in quasi-adaptation to an aquatic existence.

Milford, 17 Aug., 1905 (H. L. V.).

Family NAEOGEIDAE.

(Hebridae of Authors.)

By J. R. DE LA TORRE-BUENO.

This little family is represented in the Eastern United States by two genera and three or four species. Very little is known about their habits, further than that they frequent muddy places, swamps, etc. While by many considered as belonging in the Gerroidea, it is at best open to question. Kirkaldy believed they had affinities with the Myodochidae (Lygaeidae). Be that as it may, the apical claws serve to distinguish them from *Microvelia*, which they much resemble in general appearance. The genera may be readily distinguished thus:

Key to Genera.

Antennae four-jointed not counting jointlets **Merragata**
 Antennae five-jointed not counting jointlets **Naeogeus**

Naeogeus Laporte.

(Hebrus Curtis.)

The only certain eastern species is the following. It is to be found in almost any muddy spot, walking about. Its milky white, spotted wings reveal it to the accustomed eye.

* Hungerford has bred this also and confirms the number of stages.

N. burmeisteri Lethierry and Severin. (Fig. 154.)

Cat. Hem. iii, 51, 1896. *pusillus* Burmeister, Handb. ii, 214, 1835 (not Fallen).

New Haven, 25 March, 1911 (A. B. C.).

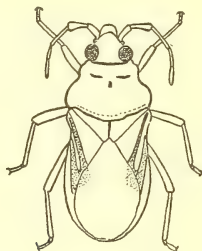


FIG. 154. *Naeogeus burmeisteri* Lethierry and Severin,—dorsal view, enlarged about fifteen times. Drawing by Dr. Philip Garman.

Merragata White.

(*Lipogomphus* Berg.)

This curious genus may at once be separated from *Naeogeus* by the antennal structure.

Key to Species.

(Adapted from Drake.)

1. Head with two grooves converging anteriorly, separated by a median ridge 2
 Head with one median longitudinal groove *hebroides*
2. Pronotum moderately constricted at sides; disk with a broad and deep longitudinal furrow *foveata*
 Pronotum more abruptly constricted, discal groove shallower .. *brunnea*

M. brunnea Drake.

Ohio Jour. Sci., xvii, 103, 1917.

This little species has been taken in New York on duckweed, in company with *Microvelia borealis*, which it somewhat resembles. It is, however, widespread throughout the United States and I have it from Illinois. Doubtless it will sometime be found in Connecticut. Nothing is known of its life history.

M. foveata Drake.

Ohio Jour. Sci., xvii, 103, 1917.

This species is described from Ohio, and seems to be more western than the other. It may be found in Connecticut, however, as so many forms supposedly foreign to us have been turned up in the East.

While *M. hebroides* White is mentioned in the key, it is only so that either of the other species may not again be mistaken for it. All my own records from the United States were based on *brunnea* Drake, and must be corrected to agree with the preceding.

Family REDUVIIDAE.

By J. R. DE LA TORRE-BUENO.

This family contains the most voracious forms of the Heteroptera; they are the tigers of the herbs. They softly stalk their prey, which seized in their spiny front legs is pierced with poisoned lancets and sucked dry of its blood while struggling. The majority live on plants, where other insect life is abundant and life easy, but some spend their lives under stones or otherwise concealed from the light of day.

Our American forms are separated into the following subfamilies, the key being frankly artificial.

Key to Subfamilies.

1. Anterior coxae short 2
Anterior coxae elongated EMESINAE, p. 690
2. Ocelli present in winged individuals 3
Ocelli absent; always fully-winged; no discoidal area at basal angle of membrane SAICINAE, p. 677
3. Hemelytra without a discoidal or quadrangular areole at basal angle of membrane 4
Hemelytra with a discoidal or quadrangular areole at the base of the membrane 7
4. Ocelli placed back of a line connecting the posterior margin of the eyes; second joint of antennae simple 5
Ocelli in front of a line across head connecting hind margins of eyes; first antennal joint stout, second of many jointlets [HAMMATOCERINAE]
5. Thorax constricted at, or in front of, middle; anterior tarsi three-jointed 6
Thorax constricted behind the middle; anterior coxae externally flat or concave PIRATINAE, p. 682
6. Apex of scutellum narrow, unarmed, or with a single spine 7
Apex of scutellum broad, armed with two spines ECTRICHODIINAE, p. 684
7. Anal area of membrane extending farther proximad than to the costal areole 8
Anal area not extending as far as the costal areole; basal joint on antennae thickened, porrect; other joints folding back under the head and first joint STENOPODINAE, p. 678
8. Ocelli not as far apart as the eyes 9
Ocelli farther apart than the eyes APIOMERINAE, p. 684
9. Anterior femora, in length equalling or exceeding hind femora; first joint of rostrum much shorter than second ZELINAE, p. 685
Anterior femora, in length less than, or rarely equalling, hind femora; first joint of rostrum equalling or exceeding second REDUVIINAE, p. 680

Subfamily SAICINAE.

There is only one representative of this subfamily in the North, namely, *Oncerostrachelus*. This genus is characterized by having the anteocular part of head very short; apex of scutellum produced into a long spine; anterior lobe of pronotum wider than long.

Oncerotrachelus Stål.**O. acuminatus (Say).**

Het. New Harm., 32, 1832; Compl. Writ., i, 356, 1859.

This little species has been taken at light and also by sifting in New York and New Jersey. It may be recognized by the generic and subfamily character. Its habits are unknown.

Subfamily STENOPODINAE.

Key to Genera.

1. Head with a furcate spine below on each side behind the eyes 2
 Head unarmed below, or armed with a simple spine, rarely with a subfurcate spine at sides of base 3
2. First antennal joint incrassate, produced in a spine beyond the insertion of the second joint **Pnirontis**, p. 678
 First antennal joint not produced beyond the insertion of the second; apex of head at base of rostrum unarmed; first joint of rostrum extending back beyond eyes; fore femora unarmed **Pygolampis**, p. 679
3. Ocelli considerably elevated; postocular part of head short, strongly narrowed backward; margins as seen from above, curved 4
 Ocelli not at all or slightly elevated; postocular part of head not at all, or very slightly and uniformly narrowed toward the back **Stenopoda**, p. 680
4. First joint of rostrum nearly as long as, or longer than, second and third joints combined 5
 First joint of rostrum not longer than second joint 6
5. Head produced; fore femora unarmed beneath; hind femora not reaching apex of abdomen; first joint of rostrum slightly exceeding the combined length of the second and third joints **Schumannia**, p. 680
 Head not produced; fore femora unarmed, slightly incrassate; hind femora scarcely reaching apex of abdomen; first joint of rostrum slightly exceeding the combined lengths of the second and third joints **Diaditus**, p. 680
6. First and second joints of rostrum equal; fore femora very little thickened, unarmed; hind femora reaching beyond apex of abdomen **Narvesus**, p. 680
 First joint of rostrum much shorter than second; fore femora incrassate, with small spines below; hind femora just reaching apex of abdomen **Oncocephalus**, p. 680

Pnirontis Stål.*Centromelus Fieber.*

This genus has the tibiae armed on the anterior edge with three spines. There are but two species, both of which are known to occur in the neighboring states.

Key to Species.

- Basal joints of antennae spiny beneath; genae not prominent .. **infirmus**
 Basal joints of antennae unarmed; genae very prominent **languida**

P. infirma Stål.

Ofv. Vet. Akad. Forh., xvi, 382, 1859.

This species has been recorded from New Jersey, and should be found in Connecticut.

P. languida Stål.

Ofv. Vet. Akad. Forh., xvi, 381, 1859.

While this is supposed to be Southern, it is here noted to make possible the distinction between these two clearly defined species, should it ever turn up.

Pygolampis Germar.*Ochetopus* Hahn.

Only two species are likely to be found within the State.

Key to Species.

Antennae short, first joint subequal to anteocular part of head;
 anterior femora incrassate**sericea**
 Antennae moderately long, first joint longer than anteocular part
 of head; anterior femora slightly incrassate**pectoralis**

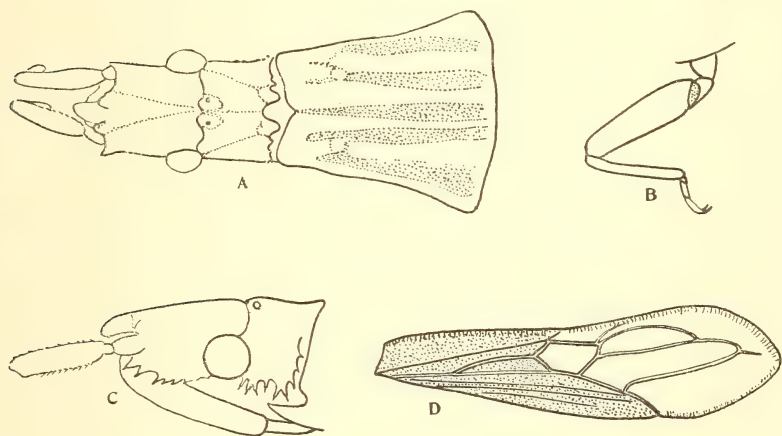


FIG. 155. *Pygolampis pectoralis* Say,—(a) head and thorax, dorsal view, (b) anterior leg, (c) lateral view of head, (d) wing. All greatly enlarged. Drawing by Dr. Philip Garman.

P. sericea Stål.

Ofv. Vet. Akad. Forh., xvi, 380, 1859.

This species has been reported from Pennsylvania.

P. pectoralis (Say). *fuscipennis* Stål. (Fig. 155.)

Ins. Louisiana, 11, 1832: Het. New Harm., 33, 1832.

Ranges from Massachusetts to Florida.

Cornwall, 9 Apr., 1920 (K. F. C.).

Stenopoda Laporte.**S. culiciformis** (Fabricius). *cinerea* Laporte.

Syst. Ent., 728, 1775.

A species recorded from New Jersey and New York, thence south to Florida, Texas, Cuba, etc.

Narvesus Stål.**N. carolinensis** Stål.

Ofv. Vet. Akad. Forh., xvi, 385, 1859.

This form is recorded from New Jersey; it should be found in Connecticut under intensive collecting.

Oncocephalus Klug, *Diaditus* Stål, and *Schumannia* Champion are Southern forms and probably are not represented in Connecticut.

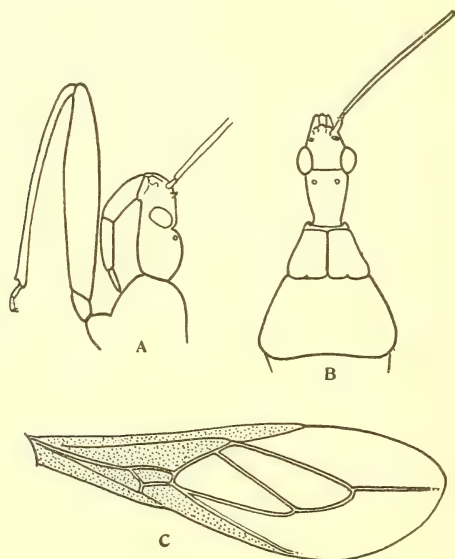


FIG. 156. *Reduvius personatus* Linnaeus,—(a) head and thorax, dorsal view, (b) lateral view of head and front leg, (c) wing. All greatly enlarged. Drawing by Dr. Philip Garman.

Subfamily REDUVIINAE.

Key to Genera.

- Antennae inserted laterally; antenniferous tubercles slightly projecting from sides of head; head much produced; ocelli at least as far apart as the eyes **Triatoma**
 Antennae inserted on top of head between margins, close to eyes; antenniferous tubercles not projecting from side of head; ocelli close to eyes; eyes large and close together **Reduvius**

Reduvius Fabricius.

Syst. Ent., 729, 1775.

R. personatus (Linnaeus). (Pl. xvi, 36.) (Fig. 156.)

Syst. Nat., Edn. x, i, 446, 1758.

This is the more or less famous masked bed-bug hunter, noted for covering itself, as a nymph, with lint and dust in houses, and thus disguised as a bit of sweeping, destroying its unsavory fellow bug. It flies to light, and is in general a nocturnal bug.

Litchfield, June, 1909 (L. B. W.); Wallingford, 25 July, 1910, 1911 (D. J. C.); Lyme, 4 July, 1911, (A. B. C.); Glastonbury, 5 July, 1913 (L. B. R.); New Haven, 1 July, 1917 (Q. S. L.).

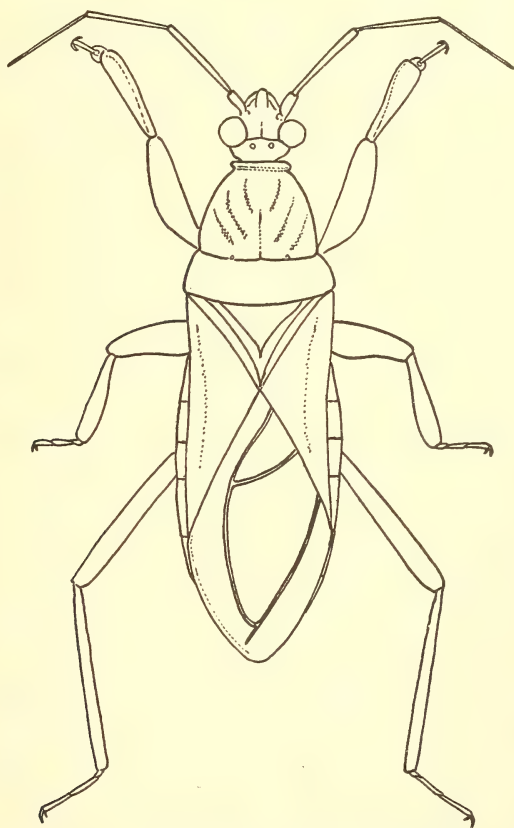


FIG. 157. *Melanolestes abdominalis* Herrich-Schaeffer,—dorsal view. Greatly enlarged. Drawing by Dr. Philip Garman.

Triatoma Laporte.*Conorhinus* Laporte.**T. sanguisuga** (LeConte). *lateralis* Stål.

Proc. Acad. Nat. Sci. Phila., vii, 404, 1855.

The so-called "big bed-bug" of the Southern States is here inserted to draw attention to the possibility of its being found in Connecticut.

Subfamily **PIRATINAE**.*Key to Genera.*

1. Middle tibiae with spongy fossae; neck with a small tubercle on each side 2
- Middle tibiae without spongy fossae; head long; no lateral tubercles on neck **Sirthenaea**, p. 684
2. Apical portion of anterior tibiae angularly dilated beneath; spongy fossae short **Melanolestes**, p. 682
- Tibiae not dilated; spongy fossae elongate **Rasahus**, p. 684

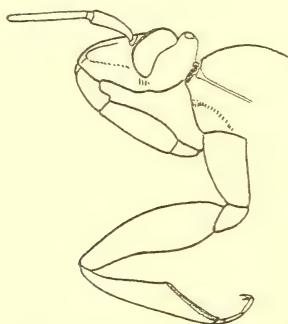


FIG. 158. *Melanolestes abdominalis* Herrich-Schaeffer,—lateral view of head. Greatly enlarged. Drawing by Dr. Philip Garman.

Melanolestes Stål.

The two species of this genus are active, bloodthirsty insects. *M. picipes* is not uncommon under stones in fields; *M. abdominalis* comes to light.

Key to Species.

- Generally apterous; entirely black, with piceous legs and antennae **picipes**
- Winged; connexivum and sometimes entire dorsum coral red **abdominalis**

M. picipes (Herrich-Schaeffer).

Wanz. Ins., viii, 62, 1848.

West Haven, 11 May, 1905 (B. H. W.); Lyme, 20 Aug., 1910 (A. B. C.); Durham, 16 Sept., 1910; Middlebury, 26 May, 1911 (W. E. B.); So. Meriden, 27 Sept., 1914 (H. L. J.); Cornwall, 9 May, 1920, 17 March, 1921 (K. F. C.); New Haven, 30 Apr., 1916 (M. P. Z.).

M. abdominalis (Herrich-Schaeffer). (Pl. xvi, 37.) (Figs. 157 and 158.)

Wanz. Ins., viii, 63, 1848.

Salisbury, 27 Aug., 1904; Durham, 16 Sept., 1910; New Canaan, 22 Sept., 1910 (W. E. B.); Torrington (R. Hochstein); New Haven, 25 May, 1911 (A. B. C.), 16 Sept., 1919 (K. F. C.); Canaan, 4 May, 1912 (D. J. C.); Bethany, 12 Apr., 1919 (K. F. C.).

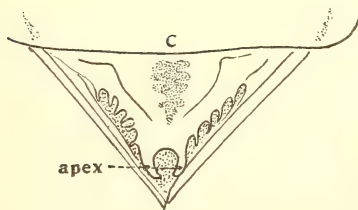
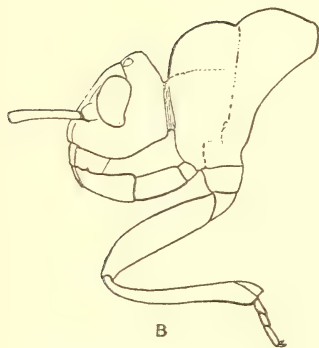
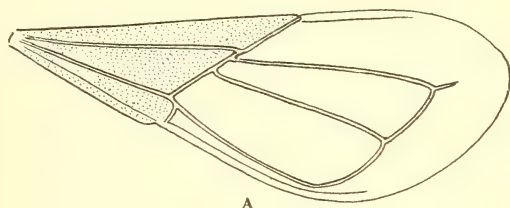


FIG. 159. *Rhiginia* (*Ectrichodia*) *cruciata* Say,—(a) wing, (b) lateral view of head and front leg, (c) scutellum. All greatly enlarged. Drawing by Dr. Philip Garman.

Rasahus Amyot and Serville.*Macrosandalus* Stål.**R. biguttatus** (Say). *thoracicus* Stål.

Ins. La., 13, 1832.

En. Hem. ii, 106, 1872.

Sirthenea Spinola.**S. carinata** (Fabricius).

Ent. Syst., Suppl., 545, 1798.

This species is not uncommon in New Jersey about electric light globes.

Subfamily ECTRICHODIINAE.

Only one genus and one species of this subfamily occur within the range of this paper.

Rhiginia Stål.*Ectrichodia* Lepeletier and Serville.**R. cruciata** (Say). (Fig. 159).

Het. New Harm., 33, 1832.

This species also has been known as *bicolor*, *crudelis* and *media*. Though it may not occur in Connecticut, it is here included to draw attention to it, should it be found.

Subfamily APIOMERINAE.

Only one genus occurs in the Eastern United States.

Apiomerus Laporte.*Key to Species.*

1. Female with outer apical angles of first genital segment deflexed, and not forming a continuous outline with the abdominal margin; male with apex of last genital segment produced into a short process in the center and armed with two spines upwardly curved and obliquely divergent 2
- Female with sides of first genital segment forming a continuous outline with the abdominal margin; male with a single truncate process at apex of last genital segment; a small species ... **ventralis**
2. Pronotum black with reddish or pale basal margin; abdominal margins more broadly pale; corium dark red **crassipes**
- Pronotum partly rufous, basal margin narrowly pale; abdominal margins at most very narrowly pale **spissipes**

A. crassipes (Fabricius).

Syst. Rhyng., 273, 1803.

A common eastern species.

New Haven, 20 June, 1902 (E. J. S. M.); Woodbury, 19 July, 1913 (W. E. B.).

A. spissipes (Say).

Jour. Acad. Nat. Sci. Phila., iv, 328, 1825.

Another reputed Western form which should be sought for in Connecticut.

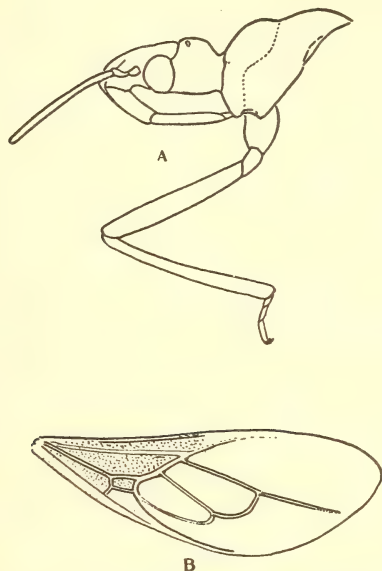


FIG. 160. *Apiomerus ventralis* Say,—(a) lateral view of head and front leg, (b) wing. Greatly enlarged. Drawing by Dr. Philip Garman.

A. ventralis Say. (Fig. 160.)

Het. New Harm., 31, 1832.

This western species has been recorded from Massachusetts and should in consequence be found in Connecticut.

Subfamily ZELINAE.

Key to Genera.

- | | |
|--|--------------------------------|
| 1. Sides of mesosternum without a tubercle or fold in front | 2 |
| Sides of mesosternum with a tubercle or fold in front at the hind angles of the prosternum; first joint of rostrum longer than the anterior part of the head | 8 |
| 2. Anterior femora as long as, or longer than, hind femora; first joint of rostrum much shorter than second | 3 |
| Anterior femora shorter than, rarely equalling, hind femora, in which case first joint of rostrum is as long as, or longer than second | 5 |
| 3. Lateral angles of pronotum armed | 4 |
| Lateral angles of pronotum unarmed | Zelus subg. typ. p. 687 |

4. Posterior disk unarmed; posterior angles with a sharp spine
[Zelus subg. *Diplodus*]
Posterior disk armed with two spinesZelus subg. *Pindus*, p. 687
5. First joint of rostrum in length equalling or exceeding second joint 6
First joint of rostrum shorter than second; anterior femora slightly shorter than hind femora; first joint of rostrum distinctly longer than that part of the head in front of the eyes ..
Pselliopus, p. 686
6. Pronotum armed with spines on disk 7
Pronotum unarmed on the disk; ocelligerous part of head not elevated; lobes of pronotum indistinctly separated
Fitchia (in part), p. 688
7. Head as seen from side suddenly constricted at base
Fitchia (in part), p. 688
Head as seen from side gradually narrowed behind the eyes
Rocconota, p. 688
8. Anterior femora thickened, spinous, densely granulated; hind femora unarmed 9
Anterior femora unarmed, a little thickened and granulated; pronotum posteriorly produced over scutellum with a high, dentate, longitudinal median keelArilus, p. 689
9. Anterior tibiae armed ventrally with three long spines; anterior femora with a long spine above, apicallySinea, p. 689
Anterior tibiae unarmed; anterior femora without a spine above ..
Acholla, p. 689

Pselliopus Bergroth.

Milyas Stål.

Key to Species.

- Scutellum with a well-defined apical keel; last genital segment of male armed with a long sharp spinebarberi
Scutellum not keeled; last genital segment of male bluntly spined
cinctus

P. barberi Davis.

Psyche, xix, 21, 1912.

This newly-described species has been recorded from Long Island, and should be found across the Sound.

P. cinctus (Fabricius). Milyas cinctus. (Pl. xvi, 39.)

Gen. Ins., 302, 1776.

This is the Eastern species found in shrubbery and in corners of clearings in small numbers. It extends from Massachusetts to Texas.

Westville, New Haven, 7 Sept., 1905 (B. H. W.); Poquonock, Windsor, 27 June, 1905 (B. H. W.); Manchester, 12 Sept., 1910 (W. E. B.); 30 Aug., 1912 (D. J. C.); 21 Sept. (B. H. W.); Lyme, 14 May, 1911; Orange, 21 May, 1911 (A. B. C.); New Canaan, 20 Sept., 1912 (H. B. K.); Portland, 15 Aug., 1913; 15, 22 May, 1914 (B. H. W.); New Haven, 9 June, 1914 (Q. S. L.); Stonington, 1 July, 1914 (I. W. D.); S. Meriden, 31 May, 1914 (H. L. J.); Plainville, 2 Sept., 1921 (B. H. W.).

Zelus Fabricius.Subgenus *Zelus* Fabricius.**Z. exsanguis** (Stål). *luridus* Stål. (Pl. xvi, 38.) (Fig. 161.)

Stett. Ent. Zeit., xxiii, 452, 1862.

This is the common species which may be beaten from almost any hardwood tree. It ranges from New York south to Texas, etc. In Connecticut it has been taken as follows:

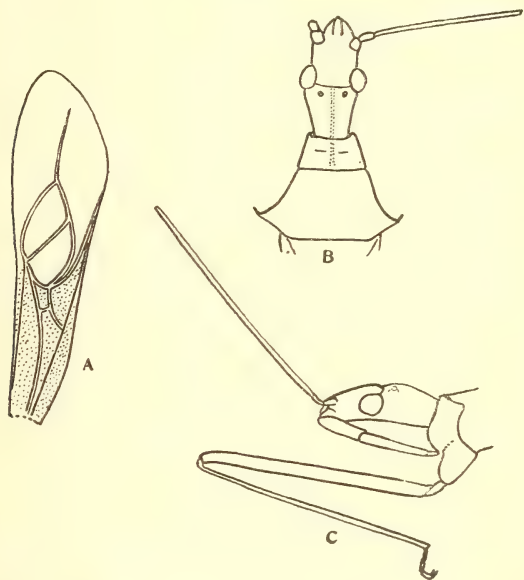


FIG. 161. *Zelus exsanguis* Stål,—(a) wing, (b) head and thorax, dorsal view, (c) lateral view of head. Greatly enlarged. Drawing by Dr. Philip Garman.

Yalesville, 26 May, 1908 (B. H. W.); Wallingford, 5, 7, 8, 21 July, 1910, 2 July, 1912 (D. J. C.); 12, 21 June, 1911 (J. K. L.); Hamden, 25 May, 1911 (B. H. W.), 28 May, 1911 (W. E. B.); Portland, 5 June, 1914 (M. P. Z.); Canaan, 14 June, 1916 (M. P. Z.); Lyme, 16 June, 1918 (B. H. W.).

Subgenus **Pindus** Stål.**Z. (P.) audax** Banks.

Ent. News, xxi, 325, 1910.

This species having been taken on the north shore of Long Island and also in Ontario should be found in Connecticut. Presumably *socius* may also be found, but there seem to be no authentic records other than from the West.

Rocconota Stål.**R. annulicornis (Stål).**

Enum. Hemip. ii, 77, 1872.

This species is found in New Jersey and doubtless occurs in Connecticut.

Fitchia Stål.*Key to Species.*

Pronotum armed with two short spines on disk, and a spine at each lateral angle **spinulosa**
 Pronotum unarmed **aptera**

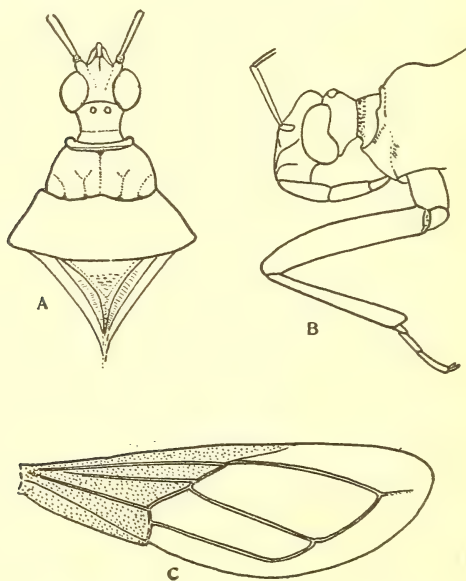


FIG. 162. *Fitchia aptera* Stål,—(a) lateral view of head, (b) dorsal view of head and thorax, (c) wing. Greatly enlarged. Drawing by Dr. Philip Garman.

F. spinulosa Stål.

Enum. Hemip. ii, 79, 1872.

This species reputedly western has been taken on Long Island, and will in all likelihood be found in Connecticut.

F. aptera Stål. nigrovittata Stål. (Pl. xvi, 40.) (Fig. 162.)

Ofv. Vet. Akad. Forh., xvi, 371, 1859.

This common species ranges south to Texas.

New Haven, 26 Feb., 21 Apr., 11 May, 1911 (A. B. C.); 21 May, 1911 (B. H. W.); Orange, 21 May, 1911 (B. H. W.).

Arilus Burmeister.*Prionotus* Laporte.*Prionidus* Uhler.**A. cristatus** (Linnaeus). Wheel Bug.

Cent. Ins. Rar., 16, 1763.

This is a familiar species, which ranges south from New York and west to California. Though no records are available, it probably occurs in Connecticut.

Acholla Stål.**A. multispinosa** (DeGeer). (Pl. xvi, 41: Eggs, Pl. xix, 1.)

Memoires, iii, 348, pl. 35, fig. 10, 1773.

This species is arboreal and preys upon all kinds of caterpillars.

Windsor Locks, 1 Sept., 1903 (W. E. B.); Branford, 16 Sept., 1904 (H. W. W.); Westville, 7 Sept., 1905 (B. H. W.); Hartford, 22 Oct., 1906 (B. H. W.); New Canaan, 7 Oct., 1907 (W. E. B.); New Haven, June, 1908 (E. B. Whittlesey); Manchester, 21 Sept., 1911 (B. H. W.); Wallingford, 5 Sept., 1911 (A. B. C.); 14 Aug., 1912 (D. J. C.); Mystic, 3 Sept., 1916 (M. P. Z.); Norwalk, 10 Oct., 1918 (M. P. Z.); Madison, 10 Aug., 1919 (K. F. C.).

Sinea Amyot and Serville.

Hem., 375, 1843.

*Key to Species.*Anterior prothoracic lobe spined on disk**diadema**Anterior prothoracic lobe with tubercles only on disk**spinipes****S. diadema** (Fabricius). (Pl. xvi, 35.)

Gen. Ins., 302, 1776.

A common species on red clover. It is, in fact, perhaps the commonest Reduviid in the East. It preys on caterpillars and other soft-bodied insects which it catches on the clover. It ranges from Canada to Southern Mexico, and in Connecticut has been taken as follows:

Canaan, 18 Aug., 1894 (A. P. M.); Salisbury, 27 Aug., 1904, Colebrook, 20 July, 1905 (W. E. B.); 1 Sept., 1911 (W. M. Wheeler); Prospect, 15 Aug., 1906 (W. E. B.); East Hartford, 9 Aug., 1904 (P. L. B.); Stafford, 24 Aug., 1905 (Mrs. W. E. Britton); East River, 29 Aug., 1908 (C. R. E.); Meriden, 28 July, 1909 (A. I. B.); Pomfret, 22 Aug., 1912 (D. J. C.); New Canaan, 11 Sept., 1914 (M. P. Z.); Kent, 10 Aug., 1918 (M. P. Z.).

S. spinipes (Herrich-Schaeffer).

Wanz. Ins., viii, 82, fig. 851, 1848.

This species is found on Long Island and there is no reason why Connecticut should not harbor it. Its recorded range is from Texas eastward.

Subfamily EMESINAE.

*Key to Genera.**

1. Anterior trochanters spineless 2
Trochanters of anterior legs with two small but distinct spines,
anterior tibiae not half as long as femora **Ploiaria**, p. 690
2. Anterior tibiae about half the length of the femora 3
Anterior tibiae nearly as long as femora **Ploiariola**, p. 690
3. Tylus very prominent; prothorax entirely distinct from meso-
thorax; head fully one-half the length of the anterior coxae
Tylus not prominent; prothorax not entirely distinct from meso-
thorax; head less than one-half as long as the anterior coxae ..
Barce, p. 690
Emesa, p. 692

Ploiaria Scopoli.

One species only of this genus may be found in Connecticut.

P. simplicipes Uhler.

Proc. Bost. Soc. Nat. Hist., xix, 430, 1878.

This species was described from Massachusetts, and would seem of possible occurrence in Connecticut.

Ploiariola Reuter.*Key to Species.*

- Mesonotum with a prominent median tubercle **tuberculata**
Mesonotum not tuberculate **errabunda**

P. errabunda (Say).

Hem. New Harm., 34, 1832.

This species is recorded from Virginia, Maryland, New York and New Hampshire. It should be found in Connecticut.

P. tuberculata Banks.

Psyche, xvi, 46, 1909.

A species described from Virginia and Sea Cliff, N. Y., the latter place being on Long Island across the Sound from Connecticut, and also recorded from Maine.

Middlebury, 26 May, 1911 (W. E. B.).

Barce Stål.*Key to Species.*

1. Femora unbanded, or possibly a band near apex on one pair only;
median carina of mesothorax distinct 2
Median and posterior femora banded; median carina of meso-
thorax not distinct **annulipes**
2. Last abdominal segment in female slightly emarginate **uhleri**
Last abdominal segment in female deeply and roundedly emarginate
fraterna

* The tables in this group are adapted from Banks, and may need to be revised when more material is at hand.

B. annulipes Stål.

Berl. Ent. Zeit., x, 168, 1866.

A not uncommon form in the East, under stones in early spring and fall. It is sometimes swept from shrubbery on the edges of fields.

New Haven, 26 Feb., 1911 (A. B. C.).

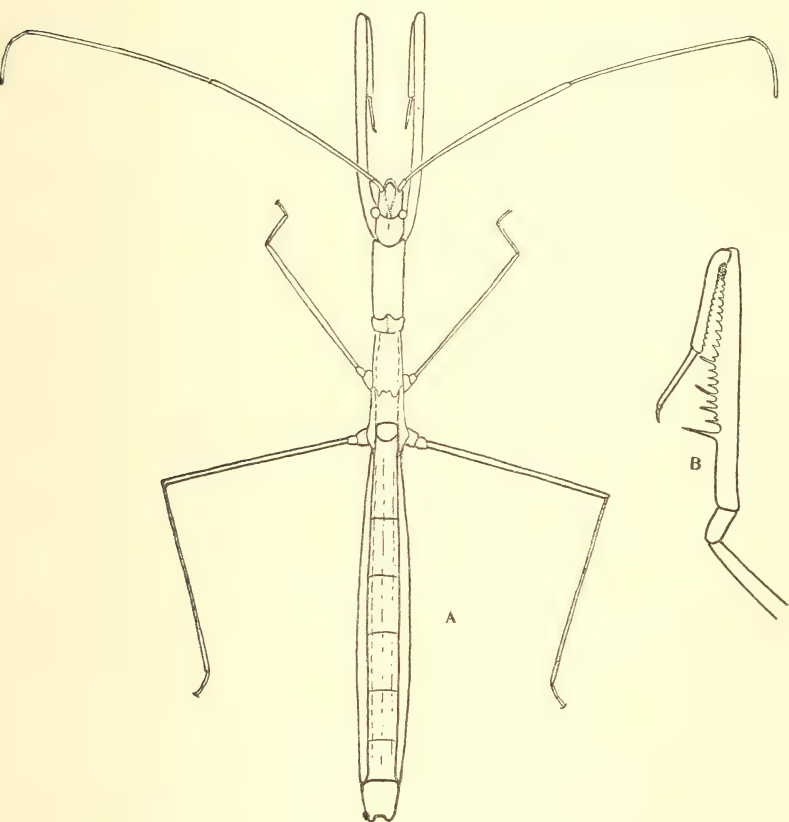


FIG. 163. *Barce fraterna* Say,—(a) dorsal view, (b) lateral view of anterior femur and tarsus. Greatly enlarged. Drawing by Dr. Philip Garman.

B. fraterna (Say). (Fig. 163.)

Hem. New Harm., 33, 1832.

This is the largest species of the genus, and usually occurs without wings. It has been taken at various places from Massachusetts to North Carolina.

B. uhleri Banks.

Psyche, xvi, 47, 1909.

This species described from North Carolina has been taken in New York, under stones. It should be found in Connecticut.

Emesa Fabricius.

Syst. Rhyng. 263, 1803.

E. brevipennis (Say). *longipes* DeGeer. (Pl. xvii, 1.)

Am. Ent., iii, pl. 47, 1828.

This, the commonest Eastern species of the group, is found in shrubbery in the corners of fields, in old barns, etc. It is said to prey upon spiders.

New Canaan, 21 Sept., 1909 (A. I. B.), 5 Sept., 1916 (M. P. Z.); Manchester, 14 Sept., 1910 (B. H. W.); New Haven, 27 Aug., 1914 (M. P. Z.), 26 Sept., 1915 (W. E. B.).

Family PHYMATIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This group includes a moderate number of stout, roughly sculptured species of medium size, closely related to the Reduviidae. Head with rostral sulcus; antennae four segmented; the terminal segment enlarged; ocelli present; rostrum apparently three segmented (the true first rudimentary); membrane with numerous and often reticulated veins; front legs raptorial, the femora very strongly thickened, the tarsi small and retractile or absent; tarsi two segmented; in the male the large sixth segment of the abdomen is terminal, above and below, the eighth forms an oval genital plate covering the seventh and following. The species are predaceous, often lying in wait in flowers for bees and other insect prey. The species of our region fall in one subfamily.

Subfamily PHYMATINAE.

Scutellum small, triangular, not covering hemielytra; veins of membrane much branched. Head short, with vertex anteriorly produced; antennae at rest received in grooves passing over eyes and along sides of pronotum. Front tibiae folding back against femora; front tarsi present. One genus is known.

Phymata Latreille.

Pronotal margins generally widened posteriorly and more or less irregularly sculptured; dorsal surface with two longitudinal carinae behind transverse impression. Corium large, with distinct veins. Abdomen concave above, more or less broadened at fourth segment.

Key to Species.

- Size large, length 8-10.5 mm.; membrane brown; sides of pronotum deeply notched at middle **erosa**
 Size small, length 6.5-7.5 mm.; membrane colorless; sides of pronotum shallowly notched at middle **vicina**

P. erosa (Linnaeus) (subsp. *wolffi* Stål.). (Pl. xvi, 34.)

Enum. Hemip., v, 133, 1876.

Yellow; a band across abdomen at widest part, reddish brown to black; dorsal surface of head, apical antennal segment, and hind lobe or entire pronotum, sometimes infuscated; the female always pale, the male generally dark.

Head longer than broad; fourth antennal segment in male distinctly longer than second and third together, in female as long as second and third. Length, 8-10.5 mm.

This species is usually found lurking in flowers, especially those of yellow color like tansy, where it is scarcely visible and finds easy prey in visiting insects. The closely related subspecies *fasciata* Gray is common farther south, and may yet be found within our limits. It is usually larger, length 9-12 mm., and rather more robust; in the male the fourth antennal segment is scarcely as long as the second and third together, in the female one-half to one-third shorter.

South Britain, 1884 (G. F. Pierce); Branford, Aug., 1905 (H. W. W.); New Haven, 7 Aug., 1905 (E. B. Whittlesey), 7 Sept., 1910 (W. E. B.) (D. J. C.); New Canaan, 14 Sept., 1905 (W. E. B.), 5 Sept., 1914 (M. P. Z.); Durham, 1 Sept., 1909 (B. H. W.); Pomfret, 22 Aug., 1912; Wallingford, 9 Aug., 1912 (D. J. C.); Essex, 18 Aug., 1914 (W. E. B.); Portland, 7 and 10 Aug., 1913 (B. H. W.); Lyme, 20 Aug., 1910 (B. H. W.); Bolton, 28 Aug., 1919, Cromwell, 12 Aug., 1919 (K. F. C.); Salem, 13, 19 Aug., 1914 (H. W. Foote).

P. vicina Handlirsch.

Ann. K. K. Nat. Hofm. Wien., xii, 150, 1897.

Light yellow; abdomen with transverse black band; head and pronotum pale to largely black; corium pale; membrane colorless; coloration darker in male than in female.

Head half as long again as wide; fourth antennal segment in male about one-fourth longer than second and third together, in female somewhat shorter than these. Length, 6.5-7.5 mm.

New Haven, 9 July, 1911 (B. H. W.).

Family ENICOCEPHALIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family includes a moderate number of very peculiar species of small size, now known to occur in all the larger faunal divisions of the world. They are especially characterized by having the head elongate and divided into two parts by a constriction behind

the eyes, the pronotum composed of three lobes separated by transverse constrictions, and the hemielytra entirely membranous.

But one species occurs within our limits.

Systelloderes Blanchard.

Small species, with shining surface and unclosed discal cell of the hemielytra.

S. biceps (Say).

Het. New Harm., 32, 1832.

Pale grayish brown; head, fourth antennal segment, and veins of hemielytra more or less infuscated; anterior portion of head and pronotum, and scutellum sometimes yellow.

Hind lobe of head somewhat longer than front lobe, subglobose, smooth, shining, narrower than head across eyes; antennae somewhat longer than head, first segment shortest, second longest, third most slender. Length 3.6-4 mm.

This rare species is sometimes taken in flight and sometimes in sifting fallen leaves. It has been found in Rhode Island, but not as yet in Connecticut.

Family PIESMIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family comprises a few species, in which the surface of the body in great part is of closely reticulate structure, a feature separating this and the next family from the other Heteropterous families. Juga long, projecting freely forward; ocelli present; pronotum not extended backward over scutellum; lateral carinae containing cavities which open beneath; hemielytra with clavus and membrane distinct, the latter shagreened but not reticulate and provided with four simple veins.

The group should undoubtedly be accorded family rank.

Piesma Lepeletier and Serville.

The only genus of the family. Head transverse, with a small tooth before each eye; tylus somewhat elevated; bucculae short and parallel. One species occurs within our limits.

P. cinerea Say. (Pl. xvii, 2.)

Het. New Harm., 27, 1832.

Coloration variable, gray to brown, spotted with dark brown or black.

Length 2.5-3 mm.

This small species is rather rare in the northeast. An immaculate form occurs which McAtee has named var. *inornata* (Bull. Brooklyn Ent. Soc., xiv, 87, 1919).

New Haven, 4 Aug., 1909 (B. H. W.), 12 Dec., 1910 (A. B. C.), 9 July, 1914 (M. P. Z.); Hamden, 23 Aug., 1910 (W. E. B.), 14 July, 1916 (M. P. Z.); Manchester, 18 Sept., 1911, Milford, 11 July, 1916 (W. E. B.); Stonington, 30 Dec., 1913 (I. W. D.).

Family TINGIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family comprises a considerable number of small species having a reticulate surface structure, as in the preceding, but with the areoles often larger, resulting frequently in a peculiar lace-like appearance. Juga short, not projecting conspicuously; ocelli absent; vertex usually armed with prominent spines; pronotum with a posterior extension, the angulate process, covering the scutellum; lateral carinae without cavities opening beneath; hemielytra entirely reticulate, lacking distinctly delimited corium and membrane. The species of this family feed exclusively on plants, generally congregating on the under side of the leaves, occasionally in destructive numbers. They hibernate in the adult stage, usually under the bark of trees.

The pronotum in the Tingidae exhibits an extraordinary degree of structural modification, being provided in some with foliaceous and globular expansions of most bizarre appearance, while in others these features are almost entirely lacking. The anterior portion bears the hood, which may be large and spherical, entirely covering the head, or so much reduced as to be hardly appreciable; the disk is provided with longitudinal ridges, or carinae, one to three in number, and of varying length; the lateral margins are expanded in lamellae, the paranota of Crampton, which may be broad and more or less reflexed toward the dorsal surface, or reduced to mere ridges.

The hemielytra offer certain characters of great importance in classification. In certain genera the central region is sharply raised, forming the discal elevation, while in others the surface is nearly plane or longitudinally channelled. The main veins delimit the following regions (Fig. 164):

1. Costal area; at the margin, sometimes greatly reduced (*membrana costae* of Stål).
2. Subcostal area; a narrow region next to the costal (*area costalis* of Stål).
3. Discoidal area; a broad region occupying the disk or central portion of the hemielytron (*area discoidalis* of Stål).
4. Sutural area; occupying the inner and apical regions. It is narrow in the short-winged forms, expanding into the apical area in the long-winged; and corresponding to the membrane of other families.

The varying areolation of these parts provides means for the differentiation of many of the species and genera. Wing dimorphism is common in this family, the hind wings being absent or abbreviated and the hemielytra somewhat shortened in the undevel-

oped form, while the pronotum is reduced in size and flattened in correlation with the reduction in the muscles of flight.

The taxonomic characters proposed by Stål have remained adequate and are employed for the most part in the present synopsis.

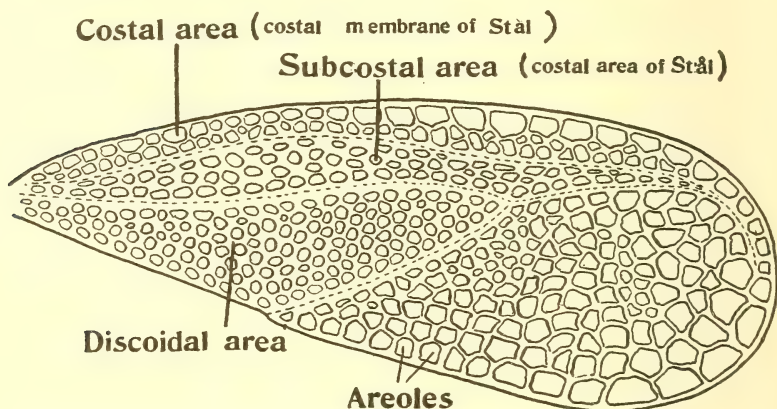


FIG. 164. *Physatochila plexa* Say,—illustrating wing of a Tingid, showing areas and areoles. Greatly enlarged. Drawing by Dr. H. M. Parshley.

Tribe TINGINI.

The hemielytra have the areas distinguishable and usually distinctly outlined by strongly elevated main veins (Fig. 164); anterior femora not abruptly thickened near base; pronotum with a more or less developed hood anteriorly; margins of pronotum and hemielytra more or less dilated.

Key to Genera.

1. Bucculae widely separated in front,* exposing the insertion of the rostrum; metasternal orifices obsolete 2
 Bucculae united or approximated in front, concealing the insertion of the rostrum; metasternal orifices usually distinct 4
2. Lateral carinae low, simple; surface not vitreous 3
 Lateral carinae of pronotum greatly developed, hemispherical; surface vitreous *Galeatus*, p. 703
3. Third antennal segment more slender than the fourth, smooth, with few fine hairs *Acalypta*, p. 698
 Third antennal segment thickened, rugose, with numerous strong setae *Dictyonota*, p. 699
4. Metasternal orifices distinct; hemielytra not strongly channelled; pronotum usually tricarinate 5
 Metasternal orifices obsolete; hemielytra longitudinally channelled; pronotum unicarinate *Drakella*,† p. 691

* With a single recorded exception, *Acalypta thomsonii* Stål.

† *Drakella* Bergroth (= *Fenestrella* Osborn and Drake) has not been found as yet in New England.

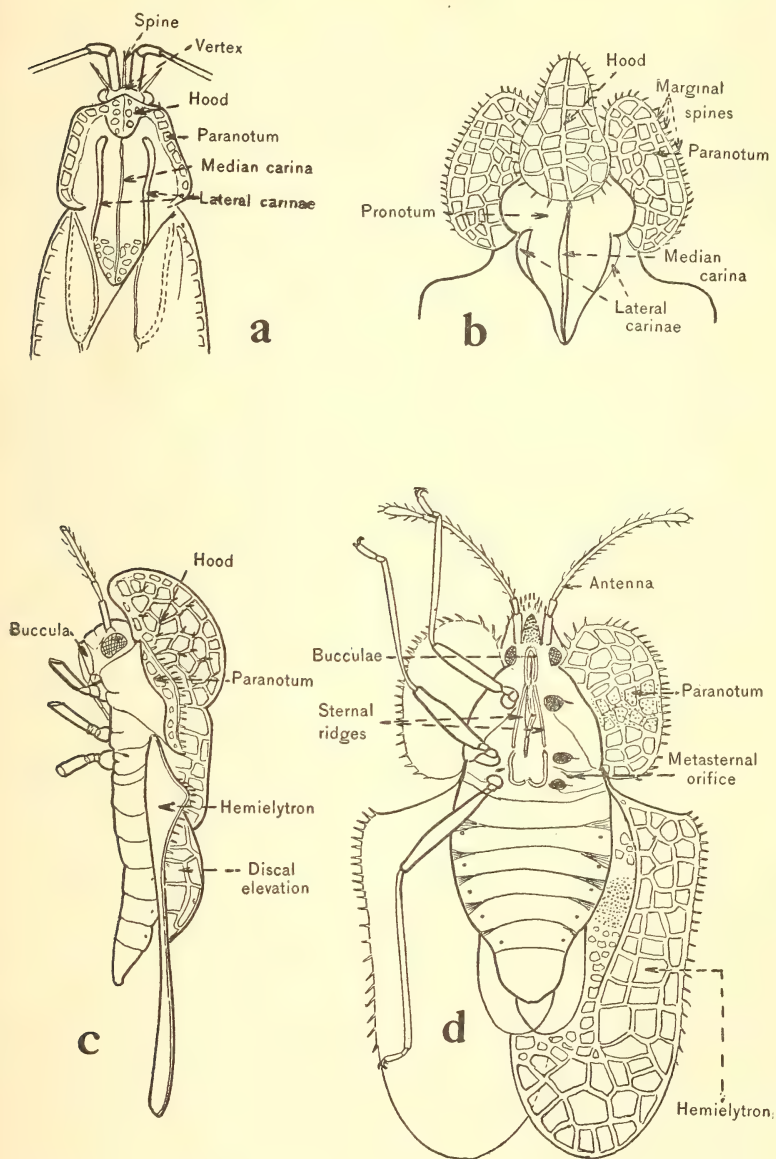


FIG. 165. Tingid structures,—(a) *Leptostyla oblonga* Say, dorsal view of head and thorax, (b) *Corythucha ciliata* Say, dorsal view of thorax, (c) lateral view of same, (d) ventral view of same. All greatly enlarged. Drawing by Dr. Philip Garman.

5. Sternal ridges not connected; hemielytra and paranota widely explanate or narrow; paranota produced or angulate anterior exteriorly when explanate 6
Sternal ridges connected by a transverse carina between meso- and meta-sternum; hemielytra and paranota widely explanate; paranota not produced or angulate anteriorly **Gargaphia**, p. 704
6. Hemielytra widely explanate; discal elevation present; pronotal hood covering head 7
Hemielytra explanate or narrow; discal elevation absent; hood not covering entire head 9
7. Lateral carinae of pronotum abbreviated, not reaching hood 8
Lateral carinae extending forward to hood **Leptobyrrsa**, p. 703
8. Hemielytra suddenly constricted at base; lateral margins approximately parallel **Corythucha**, p. 699
Hemielytra gradually widening from base **Stephanitis**, p. 703
9. Areas of hemielytra strongly delimited by distinctly costate main veins; antennae smaller in proportion; form not or slightly convex; surface dull 10
Areas not strongly delimited; antennae very large; form strongly convex; surface shining **Alveotingis**, p. 707
10. Subcostal area of hemielytra in large part with three or more rows of areoles, sometimes confused; anterior margin of pronotum not concavely arcuate 11
Subcostal area with two distinct rows of areoles 13
11. Hemielytra not explanate, extending but little beyond apex of abdomen, areoles small and more nearly equal; discoidal area usually extending beyond middle of hemielytra; first antennal segment shorter 12
Hemielytra explanate, membranous, extending much beyond apex of abdomen, some of the areoles large; discoidal area not extending beyond middle of hemielytra, its inner margin curved; first antennal segment more than twice as long as second **Gelchossa**, p. 704
12. Paranota wide, reflexed against dorsal surface of pronotum **Physatocheila**, p. 705
Paranota very narrow, cariniform, not reflexed .. **Leptoypha**, p. 706
13. Third antennal segment cylindrical, more or less enlarged at apex; dorsal surface flat; apices of hemielytra divaricate in short-winged form **Melanorhopala**, p. 706
Third antennal segment rather evenly clavate from near base; dorsal surface moderately convex; apices of hemielytra not divaricate in short-winged form **Hesperotingis**, p. 707

Acalypta Westwood.

Small ovate compact species, having the vertex with two diverging spines; eyes coarsely granulated; basal segment of antennae very thick; second much smaller, third slender, fourth short, fusiform, thicker than third; pronotum with three carinae; pronotal and hemielytral margins not widely dilated. Species dimorphic.

Key to Species.

- Costal area largely uniseriate **lillianis**
Costal area largely biseriate **thomsonii**

A. lillianis Bueno.

Bull. Brook. Ent. Soc., xi, 39, 1916.

Uniform dark brown; head, antennae, legs, and body beneath, darker.

Paranota with two or three rows of areoles; pronotal carinae slightly divergent posteriorly. Subcostal and discoidal areas of hemielytra with three or four confused rows of areoles; sutural with two rows anteriorly, this area parallel in short-winged form, widening posteriorly in long-winged. Length, long-winged form, 3 mm.; short-winged, 2.3 mm.

Taken in sweeping and in hibernation under stones. Has been found in Maine and in New York, but not as yet in Connecticut.

A. thomsonii Stål.

Enum. Hemip., iii, 122, 1873.

According to Stål, the bucculae in this species are contiguous in front, a very exceptional condition in this genus. Length 2.5-3 mm. This species may yet be found in New England.

Dictyonota Curtis.

Head with two divergent anteocular processes and two spines on vertex; antennae thick, rugose, with strong setae. Pronotum with three uniseriate carinae, a small hood not projecting over head, and wide paranota, narrowed posteriorly. One of the many Palaearctic species occurs in our territory, apparently representing a distinct variety.

D. tricornis (Schrank) var. **americana** Parshley.

Psyche, xxviii, 164, 1916.

Head and disk of pronotum black, nervures brown, membrane between the nervures gray. Legs and body beneath very dark brown, antennae black. Length 3 mm.

This form has been found only in Maine.

Corythucha Stål.

This genus contains a large number of small gauzy species, which have the antennae slender; hood large and more or less regularly globose, with an anterior extension covering the head and usually marked off from the posterior portion by a constriction; paranota extended forward; hemielytra strongly constricted and reflexed near base; lateral carinae of pronotum poorly developed as a rule; margins and dorsal surface usually more or less spinose. Many of the species are closely related and our knowledge of the limits of variation is far from adequate, but most of the species are normally confined to a single food-plant, which often aids in identification. The following key is restricted almost entirely to the species now known to inhabit New England.

Key to Species.

1. Hemelytra with a distinct transverse dark band at both base and apex, the intervening area almost or quite immaculate laterally .. 6
Hemelytra otherwise marked 2
2. Membranous parts largely hyaline; hood scarcely higher than median carina; hemelytra with basal band only .. *arcuata* var. *mali* 3
Membranous parts largely yellow, brown, or milky white 3
3. Milky white, usually with brown spotting 5
Yellow or brown 4
4. Median carina high, arched dorsally *pallida*
Median carina low, straight dorsally *ulmi*
5. Immaculate, or with two small brown discal dots on hemelytra; hood nearly flat dorsally, about as high as median carina *ciliata*
Spotted, the markings uniting to form two transverse bands at apex of hemelytra; hood more convex dorsally, higher than median carina *marmorata*
(a) Hemelytra long, the discal elevations not extending to middle var. *marmorata* typical
(b) Hemelytra short, the discal elevations extending to middle var. *informis*
6. Hood and median carina of equal height 7
Hood distinctly higher than median carina 8
7. Hood but slightly constricted; width of pronotum across paranota greatest well before middle *pruni*
Hood distinctly and sharply constricted; width across paranota greatest at middle *arcuata* var. *typ.*
8. Hood small and low, its width about equal to greatest distance between lateral carinae 9
Hood large and high, wider 10
9. Marginal spines absent or vestigial; markings reduced to spots .. *mollicula*
Marginal spines distinct; markings more regular *pergandei*
10. Apical band of hemelytra evenly transverse, its posterior margin straight; markings very dark; hood very high and angulate dorsally *cydoniae*
Apical band irregular; markings usually paler 11
11. Size large, length about 4 mm.; hood large, globose, its width more than one-third distance across paranota *associata*
Size smaller, length less than 4 mm.; hood usually narrower 12
12. Areoles of hood and paranota opaque; hood very high, the dorsal line abruptly rounded at summit, straight in front *elegans*
Areoles of hood and paranota largely hyaline 13
13. Coloration very pale, the markings indistinct; anterior margin of apical band transverse *juglandis*
Coloration dark, the markings distinct 14
14. Hood low, but little higher than median carina, the summit broadly rounded *contracta*
Hood high, at least twice as high as median carina 15
15. Size large, length about 3.9 mm.; hood large globose, evenly rounded dorsally *pallipes*
Size smaller, length less than 3.7 mm.; hood somewhat smaller, not globose, sides meeting at a sharp angle along median dorsal line *heidemanni*

C. *associata* Osborn and Drake.

Ohio Jour. Sci., xvii, 14, 1916.

A large species, feeding on the wild cherry, which has been found on Long Island, N. Y., and probably occurs within our limits.

C. pruni Osborn and Drake.

Ohio St. Univ. Bull., xx, 231, 1916.

Corythucha pyriformis Parshley. Can. Ent., lii, 81, 1920.

A large, distinctly marked species, having the hood very low and scarcely constricted. It feeds on wild cherry and has recently been reported from Maine and New Hampshire; so that it probably occurs in Connecticut.

C. juglandis Fitch.

Third Rept., Trans. N. Y. St. Agr. Soc., xvi, 466, 1856.

A species of rather small size, with faint coloration, occurring on walnut and basswood.

Scotland, 15 Aug., 1905 (B. H. W.); Stamford, 16 Aug., 1912 (W. E. B.).

C. pallipes Parshley.

In Gibson, Trans. Am. Ent. Soc., xlv, 82, 1918.

Corythucha cyrta Parshley, *Id.*, 86.

Corythucha betulae Drake, *Id.*, 86.

A rather large species with broad, spherical hood, feeding on birch, as a rule. The Connecticut specimens were taken on an imported *Salix*.

Stamford, 16 Aug., 1912 (W. E. B.).

C. heidemanni Drake.

Gibson, Trans. Am. Ent. Soc., xlv, 87, 1918.

Corythucha borealis Parshley. *Id.*, 92.

Closely related to the preceding but found on alder. It is somewhat smaller and the hood is not so regularly globose; occurs in New England.

Litchfield, 22 July, 1920 (P. G.).

C. contracta Osborn and Drake.

Ohio St. Univ. Bull., xx, 230, 1916.

Corythucha parshleyi Gibson. Trans. Am. Ent. Soc., xlv, 83, 1918.

This species, not as yet found in Connecticut, feeds on the walnut; it has been reported also from *Amelanchier*, pecan, basswood, and butternut.

C. mollicula Osborn and Drake.

Ohio Jour. Sci., xvii, 12, 1916.

Corythucha salicis Osborn and Drake. Ohio Jour. Sci., xvii, 298, 1917.

Corythucha canadensis Parshley. Occas. Papers Zool. Mus. Univ. Mich., No. 71, 18, 1919.

This is a very distinct species, easily recognized by the lack of marginal spines and the fragmentary markings; it is widely variable in size. The food plant is willow. It has been found in Massachusetts.

Thompson, 19 July, 1921 (B. H. W.).

C. cydoniae Fitch.

Country Gentleman, Vol. xiv, 25, 1861.

A common species living on the hawthorn, easily recognized by its small size, very dark markings, etc.

New Haven, 9 July, 1911 (B. H. W.).

C. elegans Drake.

Gibson, Trans. Am. Ent. Soc., xlv, 89, 1918.

A willow species, recognized by its peculiar coloration, especially the opaque areoles of hood and paranota. It has not been found in New England as yet, but occurs in neighboring states.

C. pergandei Heidemann.

Proc. Ent. Soc. Wash., viii, 10, 1906.

A small, rather pale species living on the alder; it has been recorded from several other plants also.

Chapinville, 26 May, Pine Orchard, 26 July, 1904 (W. E. B.); Brookfield, 27 July, 1910 (E. L. D.); Litchfield, 22 July, 1920 (P. G.); Thompson, 19 July, 1921 (B. H. W.).

C. marmorata Uhler. (Pl. xvii, 6.)

Proc. Bost. Soc. Nat. Hist., xix, 415, 1878.

This common species is readily recognized by its coloration; the hemielytral pattern is made up of small spots, which in part unite to form two apical bands. Its chief food plant is goldenrod. The variety *informis* Parshley is frequently met with.

Brookfield, 27 July, 1910 (E. L. D.); New Haven, 26 June, 1902 (E. J. S. M.), 23 June, 1912 (W. E. B.), 1 July, 1914 (M. P. Z.), 1 Aug., 1916 (M. P. Z.); Granby, 1 July, 1914 (I. Holcomb); Meriden, 15 July, 1909 (A. I. B.), 12 June, 1915 (H. L. J.); Portland, 14 July, 1914 (M. P. Z.); Guilford, 26 July, 1920 (M. P. Z.); Hamden, 9 Aug., 1920 (M. P. Z.).

C. ulmi Osborn and Drake.

Ohio St. Univ. Bull., xx, 231, 1916.

This species has brown markings and the apical band is wanting; it feeds on the elm.

Litchfield, 1922 (H. W. Hicock), on elm.

C. pallida Osborn and Drake.

Ohio St. Univ. Bull., xx, 230, 1916.

This species feeds usually on the mulberry, but has been reported also from basswood; it is easily recognized by its almost uniform yellowish brown color. Its occurrence in New England is probable, but not as yet definitely reported.

C. arcuata Say.

Het. New Harm., 27, 1832.

This Tingid occurs on various species of oaks, frequently in injurious numbers. It is distinguished especially by its very low hood. The variety *mali* Gibson lacks the apical band on the hemielytra.

Brookfield, 27 July, 1910 (E. L. D.); New Haven, 19 Sept., 1910 (W. E. B.); Portland, 14 Aug., 1913 (B. H. W.); Litchfield, 1 Sept., 1914 (L. B. W.); Mystic, 4 March, 1915 (M. P. Z.).

C. ciliata Say.

Het. New Harm., 26, 1832.

The sycamore Tingid, easily distinguished by its milky white

coloration; usually there are two small brown dots on disk of hemielytra.

Westville, 2 Aug., 1905 (W. E. B.); New Canaan, 14 Sept., 1905 (W. E. B.); New Haven, 3 Aug., 1909 (B. H. W.), 19 Sept., 1910 (W. E. B.); Hartford, 26 Sept., 1910 (G. H. H.); Manchester, 18 Sept., 1911 (W. E. B.), 11 Sept., 1914 (B. H. W.); Portland, 14 Aug., 1913 (B. H. W.); Meriden, 8 March, 1914 (H. L. J.); North Stonington, 21 Jan., Mystic, 4 March, 1915 (M. P. Z.).

Galeatus Curtis.

The extraordinary species belonging to this genus have the paranota and hemielytra widely explanate, surface vitreous, areoles large and often rectangular; pronotal hood small; lateral carinae greatly enlarged, forming two erect hemispheres with convexity outward; angulate process vesiculate. One species occurs in North America.

G. peckhami (Ashmead).

Ent. Amer., iii, 156, 1887.

Body black, antennae, rostrum, and legs yellowish brown, areoles of the lateral carinae of the pronotum and sutural area of hemielytra clouded with dark brown, the rest colorless, vitreous. Paranota with one series containing five areoles. Costal area with one series of large areoles. Length 4.2 mm.

Has been found in Maine and New Hampshire.

Leptobyrsa Stål.

Head covered by pronotal hood; hemielytra ample, widening from base, rounded at apex. One species occurs in North America.

L. rhododendri Horváth. *Leptobyrsa explanata* Heidemann.

Rhododendron lace bug.

Ann. Mus. Natl. Hung., iii, 567, 1905.

Body black, membranous portions pale yellow, the veinlets darker; a spot on the median carina and a transverse stripe before the middle of hemielytra, brownish. Legs and antennae yellow. Bucculae, sternal ridges, and pleurae pale. Length 3.6 mm.

Feeds on *Kalmia* and rhododendrons, often doing considerable damage.

Rockville, 28 June, 1909 (H. Wood); Greenwich, 3 July, 1913, New Haven, 30 June, 1915 (W. E. B.); Cromwell, 6 July, 1921 (M. P. Z.); Pomfret, 4 Aug., 1922 (B. H. W.).

Stephanitis Stål.

This genus, characterized by the gradually widened hemielytra and short lateral carinae, is represented in our fauna by a single species recently imported, probably on azaleas from Japan.

G. heidemanni Osborn and Drake. (Pl. xvii, 5.)

Ohio St. Univ. Bull., xx, 238, 1916.

Body black, membranous portions whitish hyaline; eyes, disk of pronotum, discoidal, subcostal, and sutural areas of hemielytra dark brown to black, the main veins paler; a few nervures of paranota and most of those in the costal area dark. Length 3 mm.

This species has usually been referred to as *G. oblonga* Say, but was distinguished by Heidemann under the MS name *affinis* and described as new by Osborn and Drake. *G. oblonga* Say, length 2.75 mm., and *G. clitoriae* Heidemann, length 2.2 mm., are included in the table of species as they will probably be found within our limits.

Feeds on the false indigo, *Baptisia tinctoria*.

Cornwall, 18 July, 1921 (B. H. W.); East Hartford, 16 Sept., 1920 (B. H. W.); New Haven, 20 June, 1920 (B. H. W.); Hamden, 14 Aug., 1921 (P. G.).

Physatocheila Fieber

(Pl. xvii, 4.)

Species of moderate or small size and compact form, the reticulation of the hemielytra and other parts being very close, as in the succeeding genera. Pronotum with three complete carinae; paranota wide and reflexed closely against dorsal surface; hood small, projecting very slightly over the head.

Key to Species.

1. Rostrum not extending beyond posterior coxae; color uniform; areoles of costal area regular 2
- Rostrum extending beyond first abdominal segment; color more or less distinctly variegated; costal area with two or three rather irregular series of areoles **variegata**
2. Costal area with two rows of areoles **plexa**
- Costal area with three rows **brevirostris**

P. plexa (Say). (Fig. 164.)

Het. New Harm., 27, 1832.

Uniform dull yellowish brown, eyes and fourth antennal segment darker; rostrum moderate and slightly variable in length, extending more or less beyond the middle coxae, but not beyond the posterior. Hood a little lower than in *brevirostris* but higher than in *variegata*. Costal area of hemielytra with two almost regular series of areoles. Form narrow, elongate oval. Length 3-3.2 mm., width 1.1 mm.

Brookfield (E. L. D.).

P. variegata Parshley.

Psyche, xxiii, 166, 1917.

Brown, variegated with black and pale cinereous. Rostrum unusually long, extending beyond the base of the second abdominal

segment. Costal area of hemielytra with areoles irregularly arranged in two or three confused rows; rather broadly oval. Length 3.4 mm.

Brookfield, 25 July, 1910 (E. L. D.); Portland, 15 May, 1914 (B. H. W.).

P. brevirostris Osborn and Drake.

Ohio St. Univ. Bull., xx, 243, 1916.

Nearly uniform dull brown; eyes, apical portion of fourth antennal segment, and sternal region darker.

Rostrum short, scarcely reaching the middle coxae. Length 3.3-3.5 mm.

New Haven, 16 June, 5 July, 1920 (B. H. W.); 9 May, 1921 (M. P. Z.); Milford, 2 May, 1921 (M. P. Z.).

Leptoypha Stål.

L. mutica (Say).

Het. New Harm., 27, 1832.

Grayish brown, with oblique dark band on discoidal area, length 3 mm. Occurs in Massachusetts.

Melanorhopala Stål.

Species of elongate depressed form, the hemielytra flat or showing only the slightest convexity; antennae usually rather long and slender, the third segment usually cylindrical, usually somewhat curved and enlarged toward the apex in varying degrees. Pronotum tricarinate; hood small and not produced anteriorly; paranota narrow, uniseriate, reflexed vertically or against pronotal surface. Hemielytra in the long-winged form widely overlapping and broadly rounded at apex, in the short-winged form very slightly overlapping, acute and distinctly divaricate at apex; main veins distinctly costate; costal area usually uniseriate, sometimes irregularly biseriate; subcostal area biseriate. A single species occurs in New England.

M. clavata Stål. (Pl. xvii, 3.)

Enum. Hemip., iii, 130, 1873.

Yellowish brown; eyes, enlarged apex of antennae, tarsi, rostrum, and some of the main hemielytral veins, dark brown.

First antennal segment longer and thicker than the second; third slender, enlarged at apex; fourth conical, narrower than third at apex.

This species is occasionally taken in sweeping. It is peculiar among the Tingidae in exhibiting sexual dimorphism in the structure of the antennae. In the male the third segment is but slightly enlarged at apex, in the female very strongly so. In the short-winged form the pronotum is reduced in area, the sides straight, the disk flat, while the hemielytra are somewhat shortened, the lateral margins curved, the apices acute and extending distinctly beyond the abdomen.

New Haven, 23 July, 1910, 20, 28 July, 1920 (B. H. W.); Branford, 13 June, 1918 (B. H. W.); Hamden, 7 July, 1920 (P. G.); East Haven, 29 July, 1920 (B. H. W.); Killingworth, 27 June, 1920 (W. E. B.).

Hesperotingis Parshley.

Form ovate, broadly so in the short-winged forms; surface of hemielytra distinctly but not strongly convex in both forms; antennae incrassate, the third segment distinctly clavate, sub-cylindrical at base and apex. Hood very feebly developed, prothorax otherwise as in *Melanorhopala*. A single species occurs in New England.

H. antennata Parshley.

Psyche, xxiv, 21, 1917.

Long-winged form. Brown; head, pronotum, and antennae beyond the middle infuscated; membranous portions between the veinlets opaque white. Anterior margin of pronotum, hood, anterior portion of paranota, and margins and apical region of angulate process, yellow. Veinlets of hemielytra light brown, a few irregularly darker; veins defining discoidal area, sometimes one running obliquely across it, one extending from its apex, and one near and parallel with sutural margin, dark brown. Third antennal segment very large, clavate, in basal third more slender than the second, in apical third about as wide as the first is long. Form elongate oval. Length 3.7-4.5 mm.

New Haven, 4 Sept., 1911 (C. E. Olsen).

Alveotingis Osborn and Drake.

Small shining species of elongate oval form, having the third antennal segment clavate, smallest at base and cylindrical toward apex; hemielytra very convex, without costate main veins, although the outlines of the areas are traceable. One species is known from New England.

A. grossocerata Osborn and Drake.

Ohio St. Univ. Bull., xx, 245, 1916.

Dark brown, veinlets black, areolar membranes gray. Antennae and legs grayish brown. Body beneath black. Hemielytra ample, extending considerably beyond apex of abdomen; sutural area with areoles grading larger inwardly and toward apex; general surface strongly convex, smooth shining.

Short-winged form. Similar to the preceding except that the pronotum is flat and narrowed; and the hemielytra are but little longer than the body, the areoles small and nearly equal in size. Length 2.8-3.4 mm.

New Haven, 5 July, 1920 (B. H. W.); 16 Aug., 1920 (P. G.); North Branford, 24 June, 1921 (B. H. W.); Westport, 12 June, 1920 (W. E. B.).

Family LYGAEIDAE.

By HARRY GARDNER BARBER, A.M.

Preliminary to the publication of this paper synoptic keys were prepared for distinguishing the subfamilies and genera of Lygaeidae known to occur within the limits of the United States. These were published in *Psyche*, Vol. xxiv, pp. 128-135, 1917, and Vol. xxv, pp. 71-88, 1918. These keys have here been revised to suit the purposes of this paper.

Stål's various synopses of this family form a reliable foundation for any treatment of the subdivisions. Later writers, myself included, have been able to offer little in the way of change or improvement of his system. Major diagnostic characters used by Stål and having an important bearing, are the position of the spiracles, whether dorsal or ventral, and the character of the suture between the second and third ventral abdominal segments. This suture in most of the subfamilies is straight and reaches the lateral margins of the abdomen, but in the largest subfamily—Rhyparochrominae—it is outwardly curved forward and does not reach the margin of the body, except in the genus *Plinthisus*.

Other important subfamily characters may be mentioned. The tylus or median lobe of the head may sometimes be sulcate or grooved (Geocorinae). The bucculae, elevated ridges or plates on either side of the base of the rostrum, are reduced or sometimes extended to the base of head (Oxycareninae). The fore femora may be more or less enlarged and are often provided with teeth or spines beneath as in most of the Rhyparochrominae. The hemelytra consist of three parts: the clavus, a relatively narrow strip along the sides of the scutellum, the corium being the remainder of the coriaceous part and the terminal membrane. The clavus, most frequently parallel-sided, may become narrowed, apically (Geocorinae) or widened (Cyminae in part). The line of meeting of the two clavi behind the apex of the scutellum is known as the commissure and its length is distinctive in the two fore-mentioned families. The relative expansion of the corium as well as its lack of punctation may play some important part.

It is not necessary to mention all of the characters used for tribal and generic diagnostic purposes. However, one or two points may be discussed to advantage. The antenniferous tubercles are the more or less triangular lateral processes forming the sides of the head, upon which the four-segmented antennae are mounted. These may be apically truncated or externally acute and viewed from the side are either straight or more or less inclined. The distance between the apex of this tubercle and the anterior margin of the eye, relative to the space back of the eye (post-ocular space) may be of great significance especially in the Rhyparochrominae. The character of the odoriferous orifices (openings of the scent glands) usually placed on the metapleura

before the posterior coxae are not often employed. These characters are shown in figures 166 and 167.

In his subdivision of the Rhyparochrominae into tribes, Stål placed great importance upon the position of the two glandular

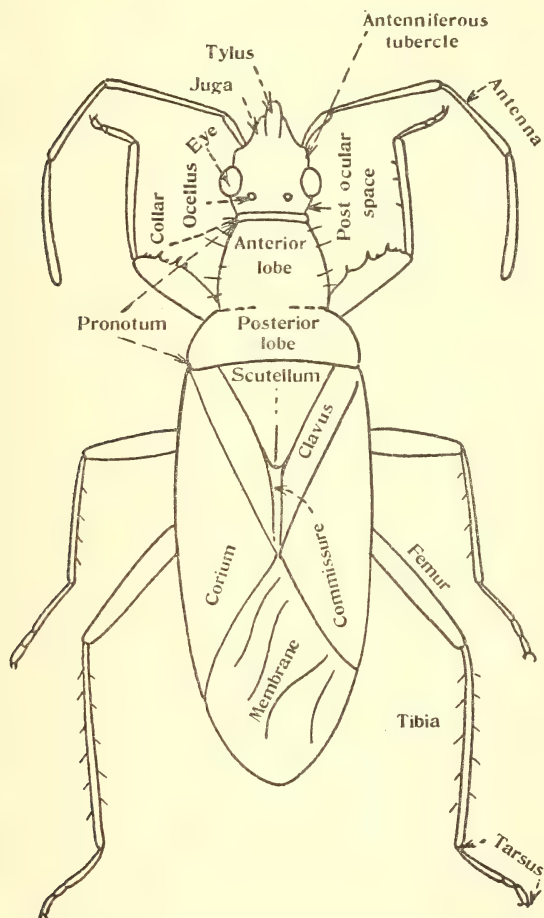


FIG. 166. *Ligyrocoris diffusus* Uhler,—illustrating Lygaeid structures, dorsal view greatly enlarged. Drawing by Mr. H. G. Barber.

opaque spots on the sides of the fourth ventral abdominal segment. Dr. Bergroth has called into question the value of these as a tribal character. This matter was discussed by me (*Psyche*, Vol. xxv, pp. 71-72, 1918), and need not be repeated here. Of secondary

importance in Stål's scheme was the nature of the lateral margin of the pronotum, whether keeled, expanded or plain. Still other characters as noted in the keys are the presence or absence of a constricted ring-like collar anteriorly on the pronotum; the coloration particularly of the two lobes of the pronotum which are often set off from each other by a transverse constriction; the nature of the bristles or the setae on the hind tibiae; the relative length of

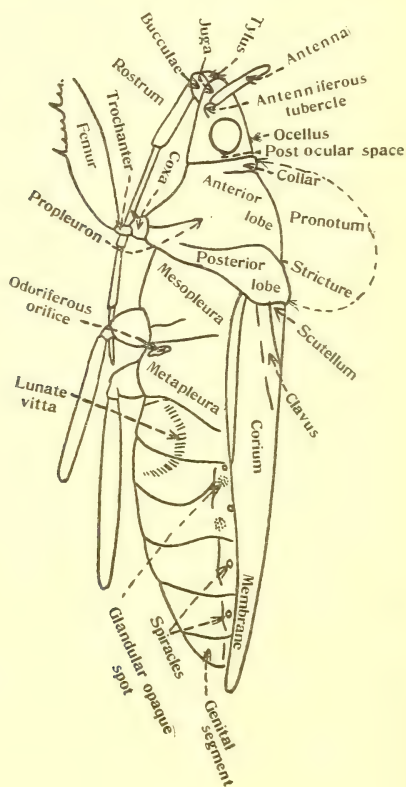


FIG. 167. *Ligyrocoris diffusus* Uhler,—lateral view showing structures. Greatly enlarged. Drawing by Mr. H. G. Barber.

the segments of the hind tarsi; the armature of the fore-femora, etc. In certain subfamilies, especially in the Rhyparochrominae, short-winged forms (brachypterous) may frequently occur.

The Lygaeidae as represented in the United States is relatively a large family, ranking second to the largest family, Miridae. Van Duzee, in his recent catalogue, lists 187 species. Most of the species are relatively of small size, *Oncopeltus fasciatus* being the

largest, and *Antillocoris pallidus* the smallest, member. From an economic standpoint a few of the Lygaeidae occupy an important position, notably the true and the false chinch bug, *Blissus leucop-terus*, *Nysius ericae*, etc. Most of the subfamilies are represented by exclusively plant-feeding species, but the Rhyparochrominae seem to be mainly carnivorous as shown by the character of their fore legs.

The antennae have four segments, and are inserted on or below the lateral margins of head. Ocelli very seldom absent. Rostrum of four segments. Hemelytra generally coriaceous, consisting of clavus, corium and membrane; clavus with rare exceptions, forming a commissure; membrane with not more than five simple veins. Coxae trochalopodous. Tarsi three segmented; claws provided with arolia. Nymphs with two or three abdominal odoriferous orifices. Eggs deposited externally.

This family is divided into seven subfamilies according to the following key:

Key to Subfamilies.

1. All sutures between the ventral segments of the abdomen straight and reaching lateral margins on each side. Head commonly without setae near eyes. Fore femora most commonly unarmed 2
Suture between the third and fourth ventral segments of the abdomen curved anteriorly and not reaching lateral margins on each side (except *Plinthisus*). Head most commonly provided with one or more setae near the eyes. Fore femora usually swollen and most commonly armed with teeth RHYPAROCHROMINAE
2. All abdominal spiracles situated dorsally. Entire posterior margin of pronotum, or at least the margin before the scutellum, turned down convexly. Fore femora not much swollen and rarely armed beneath with teeth or spines 3
All abdominal spiracles not situated dorsally, at least those of the sixth placed on the venter. Posterior margin of pronotum, at least before scutellum, commonly not turned down convexly. Fore femora more or less swollen, armed or unarmed 4
3. Posterior margin of pronotum between scutellum and lateral angles more or less distinctly depressed or impressed. Hemelytra, usually the head, pronotum and scutellum impunctate. Two interior veins of membrane commonly joined together near base by a transverse vein LYGAEINAE
Posterior margin of pronotum between the scutellum and lateral angles not distinctly depressed or impressed. Hemelytra, head, pronotum and scutellum distinctly punctate. Two interior veins of membrane not joined together near base by a cross vein .. CYMINAE
4. All abdominal spiracles not situated ventrally, at most only three apical ones so placed. Anterior femora moderately incrassate and commonly unarmed 5
All abdominal spiracles situated ventrally. Anterior femora more or less swollen and armed with one or more spines 6
5. Head always narrower than posterior margin of pronotum; tylus not sulcate. Hemelytra not convex and almost if not quite impunctate; clavus not narrowing posteriorly, commissure distinct, and at least half as long as scutellum. Fore femora sometimes much swollen (*Ischnodemus*) BLISSINAE
Head across eyes very broad, as wide or wider than posterior

- margin of the pronotum. Tylus usually sulcate Hemelytra convex and plainly punctate; clavus commonly narrowing posteriorly; commissure usually absent or very short. Fore femora moderately incrassate and unarmed **GEOCORINAE**
6. Anterior femora much swollen and armed with numerous teeth. Exterior vein of corium not parallel with costal margin. Corium not wider than abdomen. Bucculae short, confined to front of head. Posterior coxae not widely separated **PACHYGRONTHINAE**
- Anterior femora only moderately swollen and armed with a single tooth. Corium expanded, wider than abdomen; exterior vein sub-parallel with margin of corium. Bucculae extended through the head. Antennae inserted close to bucculae. Posterior coxae widely separated **OXYCARENINAE**

Subfamily **LYGAEINAE** Stål.

Key to Tribes and Genera.

1. Apical margin of corium straight, not sinuate inwardly. Exterior apical angle of antenniferous tubercles obtuse or sub-obtuse. Last dorsal segment of male truncate. Genital segment of male not foveate (Tribe Lygaeini) 2
- Apical margin of corium inwardly sinuate. Apical angle of antenniferous tubercles prominent, acute or sub-acute. Sixth dorsal segment of male rounded. Genital segment of male foveate (Tribe Orsillini) 3
2. Posterior margin of pronotum before scutellum sinuate; carinate anteriorly in the middle. Scutellum more or less tumid and carinate apically **Oncopeltus**, p. 712
- Posterior margin of pronotum truncate; without a median keel or with keel not reaching anterior margin. Scutellum not tumid; with a longitudinal keel, commonly joined to a transverse keel at base **Lygaeus**, p. 713
3. Basal segment of antennae surpassing apex of tylus. Head moderately elongate. Rostrum short, its apex scarcely reaching upon abdomen 4
- Basal segment of antennae not reaching apex of tylus. Head much elongated. Rostrum long, reaching beyond middle of venter **Belonochilus**, p. 715
4. Costal margins of hemelytra straight throughout, parallel or converging posteriorly. Eyes prominent; exposed area back of eyes greater than half of width of eyes. Bucculae less than half the length of gular area. Apex of orifices exteriorly, prominently auriculate **Ortholomus**, p. 714
- Costal margins of hemelytra straight only at base, if at all. Eyes not so prominent. Bucculae variable. Apex of orifices suddenly abbreviated, rarely sub-auriculate **Nysius**, p. 714

Tribe **LYGAEINI**.

Oncopeltus Stål.

O. fasciatus (Dallas).

List of Hemip., ii, 538, 1852.

The largest and showiest member of the family occurring in New England. Measures fully 15 mm. to tip of membrane. The hemelytra, lateral margins of pronotum and a Y-shaped mark on

the head, red with a broad band across the middle of the wings and the membrane, black.

This species is fairly common upon milk-weed throughout the United States.

Stonington, July, 1909 (G. H. H.); South Meriden, 11 Sept., 1913 (H. L. J.); Stamford, 13 Aug., 1891 (A. P. M.).

Lygaeus Fabricius.

L. kalmii Stål. (Pl. xvi, 30.)

Enum. Hemip., iv, 107, 1874.

Black, with the red markings of the hemelytra forming a cross; a spot on the vertex of the head and a transverse fascia on the pronotum, red; the latter may be broken up into three large spots. Clavus and membrane black, the latter narrowly margined with white. Size 11-12 mm.

Another common milk-weed species occurring throughout the United States.

Stamford, 13 Aug., 1891 (A. P. M.); New Haven, 15 July, 1898, 2 July, 1900 (W. E. B.), 13 June, 1902 (E. J. S. M.), 28 Aug., 1913 (B. H. W.); Montowese, 8 July, 1901 (W. E. B.); East Hartford, 2 Aug., 1905 (B. H. W.); North Haven, 3 Aug., 1905 (B. H. W.); New Canaan, 26 Sept., 1906, 16 Sept., 1913 (W. E. B.), 26 Sept., 1913 (I. W. D.), 21 Sept., 1909 (B. H. W.); Prospect, 15 Aug., 1906 (W. E. B.); Hartford, 12 Sept., 1907 (W. E. B.); Stonington, July, 1909 (G. H. H.); Wallingford, 4 Aug., 1910, 8 June, 1912 (D. J. C.); Glastonbury, 12 Sept., 1913 (L. B. R.); Farmington, 21 May, 1914 (W. Marchand); Meriden, 16 Apr., 1915 (H. L. J.); Bridgeport, 20 Oct., 1918 (M. P. Z.); Cornwall, 5 July, 1919 (M. P. Z.); Goshen, 6 July, 1919, Cheshire, 8 Aug., 1919 (K. F. C.); Southington, 6 July, 1921 (W. E. B.).

L. turcicus Fabricius.

Syst. Rhyng., 218, 1803.

A much more uncommon and narrower form than the preceding but rather closely resembling it in size and markings. The anterior half of the clavus and a Y-shaped mark on the head always red. The membrane is always entirely black. About Washington, D. C. Mr. Nathan Banks has taken this frequently on the flower clusters of *Ceanothus* in June.

Reported from the state in Van Duzee's catalogue of Hemiptera.

L. tripunctatus (Dallas). (*albulus* of var. auctt. nec Distant).

List of Hemip., ii, 559, 1852.

The smallest and probably rarest member of the genus in the New England states, measuring only some 4 mm. long. This species is quite pilose, with the pronotum paler in front and behind. The brownish membrane is variegated with white, with a large whitish premedian spot continuous transversely to the base of the membrane.

No records for the state are available but as it has been taken in

Massachusetts, Rhode Island and at Yaphank, Long Island, there is little doubt of its occurrence within the state.

Ortholomus Stål.

O. scolopax (Say). (*longiceps* Stål.)

Het. New Harm., 15, 1832.

Testaceous, with the head and pronotum, for the most part, mottling of hemelytra and legs ferrugineous, with the apex of the corium rufescent. The membrane, either clear or in part milky white with a fuliginous streak down the middle. The apex of the basal segment of the antenna extends to apex of head, with the second and third segments subequal. The rostrum reaches upon the second ventral segment of the abdomen. Length 5-6 mm.

Often confused with *Belonochilus numenius* Say, which is, however, much paler with a longer head and rostrum, the latter extended nearly to tip of abdomen.

New Haven, 20 July, 1904, 23 July, 1905, 7 Aug., 1905, 14 Aug., 1906 (W. E. B.), 16 Aug., 1904 (B. H. W.); North Haven, 3 Aug., 1905 (H. L. V., B. H. W. and E. L. D.); Brookfield, 27 July, 1910 (E. L. D.).

Nysius Dallas.

The members of this genus can easily be distinguished from the preceding by the fact that the costal margin of the corium is straight only for a short distance at base, the corium being wider than the abdomen, so that no part of the connexivum is visible. The eyes are very nearly or quite in contact with the anterior angles of the pronotum.

Key to Species.

1. Costal margins of corium at base straight for a distance nearly equal to length of scutellum thence gradually expanded. Bucculae reaching beyond middle of gular region. Smaller species 2
- Costal margins of corium straight at base for a distance less than half of scutellum, then abruptly expanded. Bucculae less than half the length of gular region of head. Larger species **californicus**
2. Basal segment of antenna short, scarcely exceeding apex of head, little more than one-third the length of second. Antenniferous tubercles shorter. Eyes less bulging; width across eyes less than diameter of posterior margin of pronotum. Bucculae gradually evanescent posteriorly, not reaching base of head. Corium less expanded posteriorly **ericae**
- Basal segment of antenna longer, usually exceeding apex of head by nearly half its length, nearly one-half as long as second. Antenniferous tubercles more prominent. Eyes more bulging; width across eyes about the diameter of posterior margin of pronotum. Bucculae extended to or very nearly to base of head, more elevated throughout, not gradually disappearing posteriorly **thymi**

N. californicus Stål.

Freg. Eug. Resa, Ins., 242, 1859.

This species, which is common in the southern United States,

reaches its northern limits in the south New England states. It is larger than the other species, measuring around 5-6 mm. Color pale ochraceous, with head, pronotum, scutellum and legs punctate with fuscous. The principal veins of the corium and the legs are spotted with ferrugineous.

New Haven, 20 July, 1904 (B. H. W.).

N. ericae (Schilling). (Pl. xvi, 25.)

Beitr. Z. Ent., i, 86, 1829.

This is the smallest and commonest member of the genus—3 to 4 mm. long; often becoming destructive to field and garden crops. It may be found sheltering in great numbers under various weeds and grasses in the fall of the year. It is closely related to and resembles the following species in character and markings and likewise was probably introduced from Europe. The characters given in the above key will serve to differentiate these two species.

New Haven, 1 Aug., 1904 (P. L. B.), 4 Aug., 1909 (B. H. W.); East Hartford, 9 Aug., 1904 (P. L. B.); North Haven, 3 Aug., 1905 (H. L. V.); Glastonbury, 27 July, 1904 (W. E. B.); Poquonock, 27 June, 1905 (H. L. V.); Orange, 21 May, 1911 (B. H. W.); Rainbow, 7, 14 May, 1915 (M. P. Z.); Brookfield, July, 1910 (E. L. D.).

N. thymi (Wolff).

Icon. Cimic., iv, 149, 1804.

This is a more northerly species which spreads into New England and although no actual record of it has been made for the state, it has been taken in most all of the other New England states, and should occur in Connecticut. It is slightly larger than the preceding species, with the costal margin of the corium more plainly expanded. Other characters are mentioned in the key.

Belonochilus Uhler.

B. numenius (Say).

Het. New Harm., 15, 1832.

Yellow, with ferrugineous punctures and rufous apex to the corium. The head is very long, nearly as long as the pronotum and well extended beyond the apex of the basal antennal segment. The rostrum is exceptionally long, reaching nearly or quite to the end of abdomen.

There is no record of this appearing in the state but close collecting will certainly discover it as it has been listed from Massachusetts and New York. Mr. Otto Heidemann has recorded this species as occurring on the ripened fruits of the Sycamore tree about Washington, D. C.

Subfamily CYMINAE.

Key to Tribes and Genera.

1. Head without a curved longitudinal sulcus before each ocellus; apical angles of antenniferous tubercles not prominent; terminal

- segment of antenna longer than third. Scutellum equilateral, with commissure shorter than the scutellum. Hemelytra commonly hyaline, not closely punctate all over. Orifices exteriorly extended and produced into a tooth at apex (Tribe ISCHNORHYNCHINI) **Ischnorhynchus**
2. Head with a curved longitudinal sulcus before each ocellus; apical angles of antenniferous tubercles prominent, acute; terminal segment of antenna shorter than third. Scutellum wider than long; clavus widened posteriorly; commissure much longer than scutellum. Hemelytra not hyaline, strongly and densely punctate all over (Tribe CYMINI) **Cymus**

Ischnorhynchus Fieber.

I. geminatus (Say).

Het. New Harm., 14, 1832.

The sparsely punctate hemelytra are much wider and longer than the abdomen and vary from partially transparent to opaque; the apex of the corium reaches beyond the end of abdomen, and the clear, transparent membrane extends for nearly half its length beyond this part of the body. The rather closely punctate head, pronotum and scutellum are reddish-fulvous.

After considerable study and comparison of our species with the European *I. resedae* Panzer, I am much in doubt as to whether Say's species is distinct from this. Individuals vary much in size and relative transparency of the corium.

New Haven, 27 June, 1902 (E. J. S. M.), 21 Oct., 1903 (H. L. V.), 4 May, 1904 (H. L. V.); North Haven, 3 Aug., 1905 (H. L. V.); West Haven, 27 June, 1905 (H. L. V.); Orange, 21 May, 1911 (A. B. C.); Rainbow, 9 May, 1912 (B. H. W.); Brookfield, 27 July, 1910 (E. L. D.); Portland, 13 Aug., 1913 (B. H. W.), 1 June, 1915 (F. W. Haasis); New Canaan, 17 Sept., 1918 (B. H. W.); North Branford, 5 July, 1921 (P. G.); Greenwich, 18 Nov., 1920 (M. P. Z.); Litchfield, 22 July, 1920 (M. P. Z.); Cromwell, 30 Aug., 1920 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.); Killingworth, 31 May, 1920 (B. H. W.).

Cymus Hahn.

Key to Species.

1. Pronotum, at least anteriorly, provided with an elevated pale, longitudinal, calloused ridge. Second antennal segment scarcely shorter than third. Head wider than long, basal segment of antenna extended about to apex of head 2
- Pronotum without a distinct median longitudinal calloused ridge. Second segment of antenna much shorter than third. Head about as long as wide; basal segment of antenna not reaching to apex of head **angustatus**
2. Apical segment of antenna scarcely shorter than third. Width of anterior margin of pronotum subequal to inter-ocular part of head. Size smaller, 3-3.5 mm. **discors**
- Apical segment of antenna very evidently shorter than third. Anterior margin of pronotum wider than inter-ocular space. Size larger, 5 mm. long **luridus**

C. angustatus Stål.

Enum. Hemip., iv, 126, 1874.

This is the commonest member of the genus, colored pale ochraceous verging into castaneous on the head, pronotum and scutellum, with a piceous spot at the apex of the clavus and the apical angles of the corium. The basal segment of the antenna does not reach to the apex of the head.

New Haven, 8 June, 1904 (W. E. B.), 15 May, 1905, 17 May, 1906, 26 June, 1910 (B. H. W.), 4 July, 1905 (H. L. V.), 7 May, 26 Feb., 1911 (A. B. C.); Branford, 27 June, 1904, 28 July 1905 (H. L. V.); Thompson, 11 July, 1905 (H. L. V.); Milldale, 21 May, 1906 (B. H. W.); Brookfield, 27 July, 1910 (E. L. D.); Danbury, 15 June, 1909 (C. W. J., H. M. P.); Milford, 12 June, 1917 (M. P. Z.); Orange, 17 June, 1920 (M. P. Z.).

C. discors Horvath.

Ann. Mus. Natl. Hung., vi, 559, 1908.

Smallest of the three species occurring in the eastern states; pale yellow testaceous usually with traces of castaneous markings on the corium.

No actual record of this species for the state is at hand, but it undoubtedly should be recorded as Parshley lists it from all of the other New England states and it occurs in New York State and further south. It is commonly collected on sedges and grasses along the edges of ponds or in swampy areas.

C. luridus Stål.

Enum. Hemip., iv, 126, 1874.

Closely resembles the preceding but is more elongated. Pale yellow-testaceous, quite frequently conspicuously tinged with red. The terminal segment of the antenna is fully one-third shorter than the third.

This species is more northerly in its distribution and I know of no record below New Jersey.

Stony Creek, 27 July, 1904 (H. L. V.); Branford, 28 June, 1905 (H. L. V.); New Haven, 17 May, 1906, 13 May, 1911 (B. H. W.); Orange, 21 May, 1911 (B. H. W.).

Subfamily BLISSINAE.

Key to Genera.

1. Body elongate; abdomen over twice as long as head and thorax together. Apical margin of corium straight. Anterior coxal cavities closed behind, along the posterior margin of prosternum. Antennae longer than head, thorax and scutellum together. Rostrum short, its apex not reaching past the middle coxae. Scutellum sub-equilateral **Ischnodemus**, p. 718
2. Body shorter; abdomen less than twice as long as head and thorax together. Apical margin of corium sinuate before apex of clavus. Coxal cavities open along posterior margin of prosternum. Width of head across eyes about one-half the diameter of posterior margin of prothorax. Antennae about as long as head, thorax and scutellum together. Rostrum longer, reaching past middle coxae. Scutellum wider than long **Blissus**, p. 718

Ischnodemus Fieber.**I. falicus (Say).**

Het. New Harm., 15, 1832.

This is the only one of the seven known United States species occurring in the northern states where it is commonly referred to as the False Chinch Bug. It is easily recognized by its elongate, narrow, depressed form. Measures some 5-6 mm. long. The hemelytra are generally abbreviated.

It is commonly swept from various wild grasses in low ground. Orange, 21 May, 1911 (B. H. W.).

Blissus Burmeister.**B. leucopterus (Say).** Chinch bug.

Het. New Harm., 14, 1832.

Measures about 3.5 mm. long. The milky white corium and membrane, with the usually conspicuous black apical angle of the former, distinguishes this species. The piceous or black head, pronotum, scutellum and venter as well as the castaneous legs are quite hairy in the New England specimens. In the typical race of this region the apical one-third of the second, all of the third and fourth segments of the antennae are piceous, the remainder pale.

A number of races are now known of which *B. leucopterus hirtus* Montandon is the common one in the northeastern states. Along the sandy stretches adjacent to the coast occurs *B. leucopterus arenarius* Barber.

B. leucopterus, commonly known as the Chinch Bug, is a serious pest of grains in the western states but seldom injurious in New England, where according to Webster it is single-brooded.

New Haven, 11 Aug., 1908, 13 May, 1911 (B. H. W.); 25 May, 1911 (A. B. C.); 19 May, 1920 (P. G.); Orange, 21 May, 1911 (B. H. W.); South Meriden, 15 Apr., 1914 (H. L. J.); Stamford, 13 Aug., 1891 (A. P. M., H. M. P.); Hartford, 22 Sept., 1922 (G. H. H.).

Subfamily GEOCORINAE.*Key to Genera.*

1. Head extended laterally, eyes obviously stalked; inner margins of eyes strongly converging throughout; not in contact with anterior lateral margins of pronotum. First segment of rostrum shorter than second or subequal to it. Ocelli commonly placed midway between inner margin of eye and middle of vertex. Head smooth, impunctate **Hypogeocoris**
2. Eyes not so obviously stalked and commonly contiguous to anterior lateral margins of pronotum; inner margins, at least anteriorly, more commonly sub-parallel. Head commonly more or less punctate or rugulose. Ocelli in most cases placed closer to inner margin of eyes than to middle point of vertex. First segment of rostrum longer than second **Geocoris**

Hypogeocoris Montandon.*(Isthmocoris* McAtee.)**H. piceus** (Say).

Het. New Harm., 18, 1832.

Only this one species of the genus occurs in the northern states. The head is extra wide, the eyes set upon short, broad stalks. Its color is very shining piceous, with the head above and below, base of first antennal segment, legs and acetabulae ochraceous. The surface, except the head, sparsely but coarsely punctate. In brachypterous forms at least, the clavus is not plainly differentiated and is level with the corium. I have never seen any specimen with the membrane fully developed.

Hamden, 24 Apr., 1911 (B. H. W.), 15 Aug., 1921 (P. G.); Portland, (W. L. McAtee); Cornwall, 14 Apr., 1920 (K. F. C.); New Haven, 21 July, 1920 (B. H. W.).

Geocoris Fallen.

Only two species of this genus occur in New England but each is subject to considerable color variation and a number of these forms have been named and described.

G. bullatus (Say).

Het. New Harm., 18, 1832.

In this species the scutellum is plainly longer than wide, generally piceous in color with an enlarged yellowish, punctate area on each side. The corium is generally griseous, with fuscous markings along posterior margin. Brachypterous form unknown to me.

G. discopterus Stål, is made a variety of this species by McAtee, 1914. It is a smaller, more profusely punctate form and as it occurs in both macropterous and brachypterous conditions I have considerable doubt of McAtee's conclusions.

North Haven, 10 June, 1907 (W. E. B.); New Haven, 10 June, 1907 (J. Barlow, H. M. P.).

G. bullatus var. *discopterus* Stål.

Enum. Hemip., iv, 136, 1874.

New Haven, 19 July, 1904 (P. L. B.); North Haven, 3 Aug., 1905 (B. H. W.).

G. uliginosus (Say).

Het. New Harm., 19, 1832.

This in all of its color variations can be distinguished from *bullatus* by the scutellum forming an equilateral triangle; this part colored uniformly piceous, without the yellowish or griseous area on each side. Most commonly the corium is more or less widely pale margined, with the inner surface piceous. The four color varieties differentiated by McAtee, 1914, can usually be distinguished by his key, as follows:

Key to Varieties.

- | | | |
|----|---|---|
| 1. | Head, except at apex, piceous | 2 |
| | Head light reddish-brown or testaceous. Pronotum and hemelytra
broadly pale margined, the latter sometimes entirely pale | |
| | var. <i>limbatus</i> | |
| 2. | Pronotum entirely piceous or with traces of pale along sides | 3 |
| | Pronotum and hemelytra more or less broadly pale margined, the
latter sometimes entirely palevar. <i>speculator</i> | |
| 3. | Costal margins of hemelytra almost entirely piceous or narrow-
pale marginedvar. <i>uliginosus</i> | |
| | Hemelytra broadly pale marginedvar. <i>lateralis</i> | |

G. uliginosus var. *uliginosus* (Say).

Het. New Harm., 19, 1832; McAtee, Proc. Biol. Soc. Wash., xxvii, 135, 1914.

New Haven, 11 July, 1920, 29 May, 18 June, 1921 (B. H. W.).

G. uliginosus var. *lateralis* (Fieber).

Wien. Ent. Monats., v, 271, 1861.

This variety will certainly be found in the state.

G. uliginosus var. **speculator** Montandon.

Bull. Soc. Sci. Buc., xvi, 227, 1908.

New Haven, 9 July, 1911 (B. H. W.).

G. uliginosus var. *limbatus* Stål.

Enum. Hemip., iv, 136, 1874.

New Haven, 19 July, 1905 (B. H. W.), 4 Sept., 1911 (C. E. Olsen).

Subfamily PACHYGRONTHINAE.

Key to Genera.

1. Antennae short; first segment shortest of all, not reaching apex of head and not clavate at apex. Head strongly deflexed from base. Scutellum sub-equilateral. Apical margin of corium toward apex of clavus more or less sinuate and outer apical angle obviously rounded. First tarsal segment of hind legs short, about as long as second and third together **Phlegyas**
2. Antennae longer; first segment longest of all, far surpassing apex of head and clavate or swollen at apex. Head not strongly deflexed. Scutellum commonly longer than wide. Apical margin of corium straight, with outer apical angle sub-acute. First tarsal segment of hind legs longer than second and third together **Oedancala**

Phlegyas Stål.

P. abbreviatus (Uhler). (Pl. xvi, 24.)

Bull. U. S. Geol. Geog. Surv. Terr., i, 313, 1876.

A very common species occurring in both the brachypterous and macropterous forms, of which the former, with the membrane not reaching beyond the fourth abdominal segment, is the most common. The head is short and wide, deflexed from base so that the

front is almost vertical. The basal segment of antenna does not reach beyond apex of head. The much swollen anterior femora are armed with a number of unequal-sized sharp teeth. The general color is pale tawny-brown, with the head, pronotal callosities, middle of scutellum, posterior margin of corium, alternate bands on connexivum, piceous or verging into castaneous frequently. Parts of the head, pronotum, scutellum and ventrally, clothed with very fine short silver-white hairs. The apex of the femora and the tibiae are banded with pale yellow. Size 4.5 mm.

New Haven, 6 July, 1904, 4 July, 1905 (H. L. V.), 17 July, 1908, 1 June, 1911 (B. H. W.); Middlebury, 16 June, 1911 (B. H. W.); Portland, 9 Aug., 1913 (B. H. W.), 14 July, 1914 (M. P. Z.); Salisbury, 27 Aug., 1904 (W. E. B.); Westville, 4 July, 1904 (W. E. B.); Branford, 28 July, 1905 (H. L. V.); Scotland, 8 Aug., 1905 (B. H. W.); Brookfield, 27 July, 1910 (E. L. D.); Litchfield, 1 July, 1916 (L. B. W.); South Meriden, 25 May, 1914 (H. L. J., H. M. P.); Norfolk, 5 June, 1919, Cheshire, 23 June, 1919 (M. P. Z.); Orange, 2 June, 1920 (W. E. B.).

Oedancala Amyot and Serville.

O. dorsalis (Say). (Pl. xvi, 27.)

Het. New Harm., 17, 1832.

As there is only this one species in New England, the generic characters given in the key will serve to distinguish it. Measures about 6 mm. long. It is yellow-ochraceous with ferrugineous punctures. The scutellum is piceous with a raised, smooth, yellow stripe on each side. The first segment of the antenna is very long, the anterior femora very swollen and armed beneath with numerous unequal teeth.

Branford, 28 July, 1905 (H. L. V.); New Haven, 9 June, 1905 (B. H. W.), 26 May, 1911 (A. B. C.); Milldale, 21 May, 1906 (B. H. W.); Lyme, 20 Aug., 1910 (B. H. W.), (A. B. C.); Wallingford, 8 June, 1911 (B. H. W.); Danbury, 15 June, 1909 (C. W. J., H. M. P.); No. Branford, 8 June, 1912 (B. H. W.); Darien, 27 May, 1915 (C. W. J., H. M. P.); South Meriden, 7 June, 1914 (H. L. J.) (H. M. P.); Woodmont, 6 Sept., 1916 (M. P. Z.); Cromwell, 23 June, 1920 (K. F. C.).

Subfamily OXYCARENINAE.

Crophius Say.

C. disconotus (Say).

Het. New Harm., 14, 1832.

This is a small species measuring not more than 3.5 mm. long. The closely punctate head and pronotum varying from dark castaneous to piceous; the much expanded and more sparsely punctate hemelytra pale testaceous; the membrane with a large dark brown spot on the disk, basally. The legs and the first two segments of antenna are reddish-ochraceous, with the last two segments of the latter infuscated.

New Haven, 25 March, 1911 (A. B. C.).

Subfamily RHYPAROCHROMINAE.

Key to Tribes.

1. With the two glandular, opaque spots, laterally on the fourth ventral segment of abdomen, widely separated, posterior one placed closer to posterior margin of segment than to anterior spot 2
 Posterior glandular, opaque spot of fourth segment of abdomen placed closer to anterior spot, most commonly remote from posterior margin of segment, sometimes furnished with a third posteriorly placed spot. With lateral margin of pronotum most commonly expanded; this frequently foliaceous between the two lobes LETHAEINI, p. 733
2. Pronotum with lateral margin of anterior lobe not obtuse or terete but either calloused or carinate or expanded or lateral emargination filled in by a foliaceous expansion or furnished within lateral margin with a series of punctures or propleura with a linear impression within lateral margin. Pronotum rarely strongly constricted transversely; rarely furnished with a constricted ring-like collar, unless head is strongly exserted, or at most only provided with a depressed series of punctures within anterior margin. Body most commonly broad with head most commonly almost or quite immersed to eyes 3
 Pronotum with lateral margins of anterior lobe obtuse, terete, neither calloused, carinate nor expanded nor longitudinally impressed within lateral margin of propleura; most commonly strongly constricted transversely to form two distinct lobes and most commonly provided with a constricted ring-like collar. If collar is absent then is the head not at all or very slightly exserted. Body commonly less depressed, more narrow-elongate MYODOCHINI, p. 723
3. Entire lateral margin of pronotum and costa, more or less laminate-expanded and most commonly in part, pale; this margin rarely, only keeled, in which case the first segment of antenna is extended far beyond apex of head and genital segment of male is tuberculate; pronotum including margin, most rarely entirely black, posterior lobe most commonly pale or variegated with pale. Posterior tibiae furnished with long rigid subspiniiform setae or bristles 4
 Lateral margins of pronotum not at all or less entirely laminate-expanded, most commonly either carinate or longitudinally impressed within lateral margin of propleura. Pronotum most commonly entirely black, ferrugineous or castaneous, with posterior lobe rarely paler, punctate with black. Head rarely strongly exserted, if so, then is a constricted ring-like collar present anteriorly on the pronotum (*Ozophora*). Hind tibia most commonly without rigid bristles only, most frequently pilose RHYPAROCHROMINI, p. 730
4. Antennae nude or with shorter pubescence, first segment sometimes furnished with a few shorter setae. Lateral, more narrowly, expanded margin of pronotum not at all or rarely sparingly punctate; anterior disk of pronotum most commonly smooth or sparingly punctate, rarely densely punctate BEOSINI, p. 732
 Three basal segments of antennae provided with rigid, setose bristles. Lateral, more widely expanded margin of pronotum and corium commonly, profusely punctate. Clavus irregularly punctate. Dorsal parts commonly pale and profusely punctate

GONIAINOTINI, p. 733

Tribe MYODOCHINI.

Key to Genera.

1. Head exserted or not, but never drawn out into a long cylindrical neck. Collar more rarely absent 2
 Head very much exserted, drawn out into a long cylindrical neck at base; longer than pronotum. Two lobes of pronotum subequal. Body narrow elongate. Hind tibia furnished with long, setose hairs. Basal segment of hind tarsus about three times as long as second and third together. Macropterous forms only ... *Myodochus*, p. 724
2. Pronotum commonly constricted at middle or a little behind middle; anterior lobe black, in all macropterous forms and in most brachypterous forms never or scarcely ever more than twice as long as posterior lobe; if more than doubly longer then the head is not exserted (as in brachypterous forms of some *Ptochiomera*) 3
 Anterior lobe of pronotum three or four times as long as posterior lobe, with transverse constriction between lobes commonly shallow or ill-defined. Head distinctly exserted. Fore tibia of males provided with a submedian tooth. Antennae elongate. Basal segment of posterior tarsus two or three times as long as second and third segments together. Brachypterous forms common 9
3. Head more or less distinctly exserted. Pronotum with a constricted ring-like collar. Body more or less elongate 4
 Head not at all or scarcely exserted, commonly immersed to eyes. Pronotum without a constricted ring-like collar, at most with anterior margin depressed or furnished with a series of punctures; strongly constricted to form two lobes, both of which are punctate, the disk of the anterior one sometimes more sparingly so. Clavus with three rows of punctures. Posterior tarsus with basal segment subequal to second and third together 8
4. Head commonly strongly contracted back of eyes; postocular space commonly subequal to or sometimes shorter than space between base of antenna and eye 5
 Head strongly exserted, forming a short neck at base; postocular space about four times as long as space between base of antenna and eye. Eyes placed about midway on head. Hind tibia provided with fine rigid bristles. Basal segment of posterior tarsus about as long as second and third together. Macropterous and brachypterous forms *Heraeus*, p. 725
5. Second and third ventral abdominal segments not furnished with finely strigose lunate vittae 6
 Second and third ventral abdominal segments furnished on each side with a finely strigose, lunate vitta *Ligyrocoris*, p. 725
6. Two lobes of pronotum commonly separated by a more shallow obtuse constriction. First segment of rostrum commonly reaching base of head 7
 Two lobes of pronotum separated by a deep, clean cut, transverse constriction. First segment of rostrum not reaching base of head. Hind tibia most commonly furnished with short bristles *Orthaea*, p. 727
7. Posterior tarsus with basal segment fully three times as long as second and third together. Hind tibia provided with long rigid bristles only. Antennae legs and body nearly nude. Form of body narrow-elongate, with longer legs. Scutellum carinate throughout *Zeridoneus*, p. 727
 Posterior tarsus with basal segment not more than twice as long as second and third together. Body, legs and antennae furnished

with long setose hairs, the hind tibia also with a few rigid bristles apically. Form of body broadly oval with shorter legs

Perigenes, p. 727

8. First segment of antenna exceeding apex of tylus by one-half its length. Anterior margin of pronotum depressed, punctate. Basal disk of scutellum depressed before a premedian, transverse or crescentic ridge, posteriorly carinate. Fore femora armed with several teeth. In brachypterous forms membrane may be almost or entirely wanting, the clavus flat, not deflected to corium and anterior lobe of pronotum swollen and more than twice the length of posterior one. Species not at all or only slightly shining

Ptochiomera, p. 728

First segment of antenna short, scarcely exceeding the tylus. Anterior margin of pronotum not depressed. Basal disk of scutellum depressed followed by a longitudinal carina. Incrasate fore femora armed with two or three preapical teeth one of which is frequently enlarged. In brachypterous forms the membrane is only a little shortened, the clavus always deflected to the corium. Species very shining

Kolenetrus, p. 728

9. Anterior lobe of pronotum impunctate, demarked from posterior lobe by a transverse impressed line; provided with a distinct ring-like collar. Basal segment of antenna with a few setose bristles. Ocelli absent. Fore tibial tooth of male at middle or posterior to middle. Hind tibia provided inwardly and outwardly with rigid bristles. Basal segment of hind tarsus three times as long as second and third together. Large species

Cnemodus, p. 729

Anterior lobe of pronotum sparsely punctate, two lobes separated by an obtuse sinus, not indicated by an impressed line; anterior margin depressed, punctate. Basal segment of antenna without setose bristles. Ocelli present. Fore tibial tooth of male anterior to middle. Hind tibia with a few setose bristles inwardly. Basal segment of posterior tarsus about twice the length of second and third together. Smaller species

Pseudocnemodus, p. 729

Myodochus^a Latreille.

M. serripes Olivier. (Pl. xvi, 29.)

Encyc. Meth., viii, 106, 1811.

A very distinctive species by reason of its long, slender, cylindrical neck. The head is shining, the pronotum dull black; the hemelytra brown with pale margin. By reason of the slender body the legs seem rather long, the fore femora being longer than the intermediate ones; the former as well as the posterior femora are apically piceous. The apex of the second segment of the rostrum does not reach the base of the elongated head. The hind tarsus is very long, at least three times as long as second and third together. Size 8-9 mm.

This is a widely distributed species sheltering under boards, etc., on the ground and is in part at least predaceous.

New Haven, 17 June, 1902 (E. J. S. M.), 18 March, 21 Apr., 1911 (A. B. C.), 26 June, 12 Aug., 1912 (at light); East River, 15 July, 1908 (C. R. E.); Lyme, 30 Apr., 1911 (A. B. C.); Wallingford, 23 Nov., 1912 (H. B. K.); Portland, 10 Aug., 1913 (B. H. W.); Farmington, 18 Aug., 1914 (W. M.) (H. M. P.); Winnipauk, 12 June, 1915 (C. W. J.) (H. M. P.).

Heraeus Stål.**H. plebejus Stål.**

Enum. Hemip., iv, 147, 1874.

General coloring and shape much as in the preceding but considerably smaller and less slender—about 5 mm. long. The base of the dull black head is not drawn out into a long cylindrical neck and the eyes are set midway between base and apex of head. Basal segment of rostrum does not quite reach to base of head. Basal segment of posterior tarsus only twice as long as second and third segments together. Anteriorly this insect is quite pilose or hairy.

Also found sheltering under boards and other loose objects lying on the ground and with similar predaceous habits.

New Haven, 7 May, 1911 (A. B. C.).

Ligyrocoris Stål.*Key to Species.*

1. Corium with a distinct post-median transverse fascia. Membrane without a median longitudinal pale streak but often pale at apex 2
Corium without a post-median transverse fascia; costal margin narrowly pale. Membrane with a pale streak through the middle **depictus**
2. Anterior lobe of pronotum and fore femora sparsely setose. Diameter of pronotum at collar plainly less than at constriction between the two lobes. Markings of corium castaneous or ferrugineous with the post-median fascia generally not quite reaching edge of corium. Membrane commonly produced to end of abdomen; veins for the most part pale **diffusus**
Anterior lobe of pronotum and fore femora nearly or quite devoid of setose hairs. Diameter of pronotum at collar subequal to diameter at post-median constriction. Markings of corium fuscous or piceous with the post-median fascia extended entirely to edge of corium. Membrane most commonly not extended to apex of abdomen; apex triangularly pale **sylvestris**

***L. depictus Barber.**

Jour. N. Y. Ent. Soc., xxix, 109, 1921.

Closely related to *diffusus* Uhler, but readily distinguished by the relatively longer antennae, dark castaneous hemelytra without any evidence of the usual transverse fascia. Usually the membrane is a little shorter than the abdomen and provided with a pale streak down the middle.

Portland, 9 Aug., 1913 (B. H. W.); Westport, 24 June, 1921 (W. E. B.).

L. diffusus (Uhler). (Figs. 166 and 167.)

Proc. Bost. Soc. Nat. Hist., xiv, 101, 1871.

Head, anterior lobe of pronotum, apical half of third and all of fourth segment of antenna piceous black. Four fascia on the posterior lobe of the pronotum and most of the inner part of the hemelytra dark castaneous-brown. The costal margin pale

throughout, much more narrowly so opposite the post-median and apical castaneous spots; in other words, the transverse post-median and apical fasciae do not quite reach the outer edge of the hemelytra. Near the inner apical angle of the corium is a conspicuous pale spot. The legs are variable, most commonly pale, with the femora often entirely pale ferrugineous or sometimes apically infuscated. The head, pronotum and scutellum are provided with quite a number of long setose hairs which are almost entirely wanting in the following species. The membrane is embrowned, with the nervures and a small spot at apex pale. Apex of membrane extended to tip of abdomen. I have never seen a brachypterous form of this species. 5-6 mm. long.

Thompson, 3 Aug., 1892 (A. P. M.); New Haven, 8 July, 1904 (P. L. B.), 5 Sept., 1905, 18 June, 1911 (B. H. W.); Salisbury, 27 Aug., 1904 (W. E. B.); Stony Creek, 12 Aug., 1904 (P. L. B.); East Hartford, 9 Aug., 1904 (P. L. B.); Scotland, 25 July, 1904 (B. H. W.); Rockville, 23 Aug., 1905 (H. L. V.); Colebrook, 21 July, 1905 (H. L. V.); Stafford, 24 Aug., 1905 (W. E. B.); Mount Carmel, 25 Aug., 1906 (B. H. W.); East River, 11 July, 1908 (C. R. E.); Brookfield, 27 July, 1910 (E. L. Dickerson); Orange, 4 June, 1910 (B. H. W.); Hamden, 18 July, 1916 (M. P. Z.); New Canaan, 12 Sept., 1918 (M. P. Z.); Madison, 25 July, 1919 (W. E. B.); Litchfield, 22, July, 1920 (P. G.); North Haven, 4 Sept., 1921 (B. H. W.); Stratford, 9 July, 1920 (B. H. W.); Waterbury, 15 Oct., 1920 (B. H. W.).

L. sylvestris Linnaeus (*contractus* Say).

Syst. Nat., 449, 1758.

Very closely related to and often difficult to distinguish from the preceding species. Generally darker colored with the head, anterior lobe of pronotum, scutellum and most of the corium pale, interrupted just behind middle and also at apex with large conspicuous spots or fasciae which reach entirely to edge of costal margin. The usual conspicuous pale spot near inner apical angle of corium is generally quite or almost effaced, and the usual paler fascia of the posterior lobe of the pronotum are inconspicuous. The legs which are also variable are more inclined to darker coloration, with the fore femora, except the knees and basally and the apical part of the intermediate and posterior pairs, piceous. Other noticeable differences are the following: antennae are evidently longer; the head and pronotum almost or quite denuded of long setose hairs; the posterior lobe of the pronotum is relatively narrower in relation to the diameter of the anterior lobe, where in brachypterous forms especially the two lobes are nearly equal in diameter; the corium anteriorly paler; the membrane is fuliginous with few if any of the veins paler and with a more conspicuous triangular pale spot at apex.

This species is more northerly in its spread than *diffusus* and occurs most commonly in the brachypterous form with the membrane usually reaching to middle of sixth segment.

Orthaea Dallas.*O. basalis* (Dallas).

List of Hemip., ii, 575, 1852.

A small species measuring some 4 mm. long. In common with most of the species of this tribe the head, anterior lobe of the pronotum and scutellum are dull piceous-black; the posterior lobe of pronotum infuscated but paler particularly in the middle. The hemelytra are grayish, much punctured with fuscous and with a conspicuous pale spot near the inner apical angle of the corium. The antennae are mostly pale except for the terminal segment which is dark brown. The much swollen fore femora, except the knees, and a preapical ring on the middle and hind pairs, piceous.

Found commonly under stones, sticks, etc., particularly in the fall of the year.

Rainbow, 9 May, 1912 (B. H. W.).

Zeridoneus Barber.*Z. costalis* (Van Duzee).

Can. Ent., xli, 373, 1909.

This is a rather large, narrow species, measuring about 7 mm. long, much resembling a *Ligyrocorid* in character. Head, anterior lobe of the pronotum and scutellum piceous-black; the posterior lobe of the pronotum is fuscous with four longitudinal fasciae, the outer ones along the margins. The hemelytra are dark brown, punctate with fuscous, with the entire costal margin except at apex, pale yellow; the usual pale spot near inner apical angle of the corium is inconspicuous or effaced. The membrane is embrowned and somewhat irrorate with pale. All dorsal parts, as well as antennae and legs, denuded of hairs. The legs are mostly pale with the fore femora broadly in the middle and the two others apically, piceous. The antennae pale with first, apical part of second and third and all of fourth segment brown. Hind and middle tibia with stiff bristles only. The basal segment of hind tarsus over three times as long as second and third segments together.

This is a northern species rather uncommon south of the New England States.

South Meriden, 6 July, 1914 (H. L. J.); Guilford, 13 July, 1920 (B. H. W.).

Perigenes Distant.*P. constrictus* (Say).

Het. New Harm., 15, 1832.

A broader and slightly shorter species than the preceding which it much resembles in coloration. However, it is easily distinguished by the fact that the dorsal parts, legs and antennae are quite pilose. The costal margin of the corium is pale interrupted

by a transverse fascia behind middle and apex dark brown in common with the inner field of the corium. Membrane dark brown with some of the veins in part pale. Legs and antennae colored much the same as in the preceding but their pilosity is quite distinctive. The basal segment of the hind tarsus is relatively shorter about twice the length of second and third together and the fore femora are not so strongly armed.

Wallingford, 11 July, 1910 (D. J. C.); Salem, 12 July, 1914 (H. W. Foote).

Ptochiomera Say.

P. nodosa Say.

Het. New Harm., 18, 1832.

A small species, about 3 mm. long, which is easily identified by the incrassate character of the last two segments of the antennae, especially noticeable in the females. The piceous anterior lobe of the pronotum is strikingly contrasted with the pale anterior margin and posterior lobe of the pronotum as well as the scutellum and hemelytra. The head, scutellum except on the carinae and three or four longitudinal fascia on the hemelytra pale, castaneous or ferrugineous. The legs and first two segments of the antennae are pale yellow, the swollen third segment of the latter is piceous while the fourth is mainly ferrugineous. While in most of the other species of this tribe the scutellum is nearly plain, here it is strongly keeled behind a sub-basal, crescentic, transverse ridge.

This is another ground species often brachypterous, commonly sheltering under objects. No record of this has been found for the State as yet, but it undoubtedly should occur there as it occurs in neighboring states.

P. clavigera Uhler.

Hemip. Col., 24, 1895.

A little smaller than *nodosa*, with the last two segments of the antennae likewise much swollen. Color dull castaneous brown, closely and coarsely punctate with fuscous, with few strongly contrasting colors. The transverse constriction between the two lobes of the pronotum much more shallow than in the preceding.

Cornwall, 28 Nov., 1919 (K. F. C.).

Another species of the genus—*P. ferruginea* Stål, occurs in the east but has not been reported from the State.

Kolenetrus Barber.

K. plenus (Distant). *Rhyparochromus plenus* Distant.

Biol. Centr. Am., Heterop., i, 216, 1882.

This is apparently a rare species in the State as only one record is at hand. The head, pronotum and scutellum are shining piceous and rather closely and evenly punctate. The hemelytra are shining grayish with some piceous markings posteriorly. The

antennae have the basal and terminal segment dark brown, the second and third, pale ferrugineous. All femora except their apices are piceous, the tibia pale; the swollen fore femora of the male have but a single tooth. Measures about 3.5 mm. long.

It is another ground species likely to be taken sifting among dead leaves.

Georgetown, 23 Aug., 1910 (Am. Mus. Nat. Hist.).

Cnemodus Herrich-Schaeffer.

C. mavortius (Say). (Pl. xvi, 28.)

Het. New Harm., 19, 1832.

An elongated species, 9 mm. long, with piceous-black body and long pale legs. It is chiefly characterized by the elongate and often inflated fore-lobe of the pronotum, which is at least three times as long as, and most often wider than the posterior lobe. The costal margins of the hemelytra are pale. The eyes are not in contact with the pronotum but set mid-way between base of head and tip of antenniferous tubercles. Ocelli are wanting. The antennae are long, with the basal segment extended much more than half beyond tip of head, basally pale with the fourth segment embrowned. The elongate fore femora are armed with an outer row of five or six strong teeth and an inner row of five or six smaller teeth. The fore tibia of the male is strongly bent near base and armed behind middle with a strong, curved tooth. This species occurs most common in the brachypterous form with membrane poorly developed, scarcely extended beyond the apex of the corium.

Lyme, 12 March, 1911 (A. B. C.); South Meriden, 18 May, 1915, (H. L. J.) (H. M. P.).

Pseudocnemodus Barber.

P. canadensis (Provancher).

Pet. Faune Ent. Can., iii, 84, 1886.

Resembles a small *C. mavortius* Say, but it is pale castaneous-brown in place of black, with the humeral angles, costal margins of the hemelytra, antennae and legs for the most part, stramineous-yellow. The fore lobe of the pronotum less often inflated, is relatively shorter than in the preceding species and is not demarked from the anterior lobe by an impressed line. The antennae have the apical half of the third and all of the fourth segment embrowned. The legs have the apices of the femora embrowned; the incrassate fore femora armed with two rows of weaker spines. The strong fore tibial spine of the male is placed before the middle. The brachypterous form is also here the most common, with the membrane not extended beyond apical angle of the corium. Measures about 6 mm. long.

Connecticut (Van Duzee Catalogue, 1917); Salem, 22 July, 1914 (H. W. Foote).

Tribe RHYPAROCHROMINI.

Key to Genera.

1. Anterior margin of pronotum without a ring-like collar, at most faintly impressed or provided with a series of punctures within. Pronotum strongly transverse with margins very slightly keeled and not reflexed. Head not at all or very slightly exserted. Commissure less than one-half the length of scutellum. Hind tibia without rigid bristles. Basal segment of posterior tarsus not twice as long as second and third together 2
- Anterior margin of pronotum with a distinct ring-like collar; not transverse; lateral margins slightly expanded and reflexed; distinctly separated into two lobes by an obtuse constriction just before middle. Head not transverse, exserted, commonly contracted back of eyes; this post-ocular space subequal to space between base of antenna and eye. Basal segment of antenna stout and long, apex of tylus not reaching middle of this segment. Basal segment of rostrum reaching base of head. Clavus irregularly punctate; commissure nearly as long as scutellum. Anterior femora elongate, not strongly incrassate, armed beneath with three or four equidistant spines. Posterior tibia with short rigid bristles. Basal segment of posterior tarsus fully twice as long as second and third together. Mostly macropterous.
2. Pronotum with disk of anterior lobe black; posterior lobe testaceous punctate with fuscous; lateral margins slightly carinate. Scutellum much longer than wide, a little longer than pronotum, posteriorly bivittate with pale. Dorsal parts dull, not pilose. First segment of antenna much shorter than second, and evidently shorter than basal segment of rostrum. Fore femora incrassate and armed with several strong and a few smaller teeth. Clavus with three rows of punctures, the middle series abbreviated. Macropterous forms only. Size larger **Ozophora**
- Pronotum with both lobes concolorous or nearly so, ferrugineous or castaneous. Scutellum equilateral, not bivittate with pale. Fore femora slightly incrassate, unarmed. First and second segments of the antennae nearly equal, the former longer than the first segment of the rostrum. Body more or less pilose. Macropterous and brachypterous. Small species 2 mm. long **Peritrechus**
- **Antilocoris**

Ozophora Uhler.

O. picturata Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 102, 1871.

This is the lone representative of the genus in any of the eastern states. Head, anterior lobe of pronotum, five rather obscure longitudinal fasciae of posterior lobe, central disk of scutellum, markings of the hemelytra and beneath, dark castaneous; sternum often darker. The following parts are pale stramineous—four obscure fasciae of posterior lobe of pronotum, submarginal calloused streak on either side of scutellum, much of the hemelytra, antennae except apex of the last three segments, legs with exception of a

subapical darker ring of the posterior femora. The pale ring on the base of the terminal segment of the antenna is striking. The hemelytra are punctate with castaneous-brown and provided with an interrupted transverse fascia behind the middle surrounding a conspicuous pale spot at inner apical angle of corium; posterior angle of the corium also castaneous. Membrane embrowned with the apex and often the veins pale. Length 6 mm.

Frequently taken by sifting among dead leaves in the late fall or found sheltering under boards on the ground.

New Haven, 11 March, 1911 (A. B. C.).

Peritrechus Fieber.

P. fraternus Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 103, 1871.

This bears no resemblance to the preceding species. Head, anterior lobe of pronotum and most of the scutellum dull piceous black. Posterior lobe of pronotum, apical V-shaped fascia of scutellum and hemelytra grayish, rather closely punctate with fuscous. The antennae are dark brown and finely pilose. The legs are variable, frequently pale castaneous, more often with the femora except at base and extreme apex and the tibiae towards base dark brown or piceous. The enlarged fore femora armed with two or three small teeth in the middle region. Length 4-5 mm.

Also most frequently taken under boards or by sifting dead leaves.

Certain to occur in the State as it has been recorded from Massachusetts, New York and New Jersey.

P. paludemaris Barber.

Bull. Am. Mus. Nat. Hist., xxxiii, 516, 1914.

Closely resembling *P. fraternus* in appearance but separable by comparative differences. The whole insect is a little longer and a little more slender, with the usual paler colorations, especially of hemelytra and membrane, darker. A striking difference is found in the relative width of pronotum across the rounded anterior angles where it is much more contracted in *paludemaris*.

The habitat is quite distinctive as it is an inhabitant of the salt marshes along the Atlantic Coast from Massachusetts to Maryland, so far as my records show.

It has not yet been recorded from the State but certainly is to be found there.

Antillocoris Kirkaldy.

A. pallidus (Uhler).

Proc. Zool. Soc. Lond., 187, 1894.

One of the smallest members of the Lygaeidae. Head, pronotum and scutellum castaneous, the head somewhat shining. The hemelytra are a little paler. Membrane brownish, pale at base;

in brachypterous forms fairly well developed but not reaching apex of abdomen. Dorsal parts, viewed from side, sparsely pilose. A characteristic peculiarity is the relatively long basal segment of the antenna which is as long as or longer than second segment and longer than the first segment of the rostrum. The legs are pale stramineous-yellow with the scarcely swollen fore femora unarmed. Length 2 mm.

This is a common species among dead leaves in damp situations.

New Haven, 5 June, 1916 (M. P. Z.); 24 May, 1920 (B. H. W.).

A. pilosulus (Stål).

Enum. Hemip., iv, 158, 1874.

Same size, color and general appearance of the preceding but very much more pilose, particularly when viewed from the side. In brachypterous forms the membrane is entirely absent.

Occurs in similar situations as its close relative but has not yet been reported from the State. It is certain to occur there as it has been taken in Massachusetts, Orange Co., N. Y., and New Jersey.

Tribe BEOSINI.

Key to Genera.

1. Dorsal parts dull, not entirely black. Lateral expanded margins, posterior lobe of pronotum and the hemelytra pale, punctate with fuscous. Punctures of pronotal margins set with setae. Scutellum longer than wide, bivittate with pale. Antennae provided with numerous short, setose hairs. Basal segment of posterior tarsus a little longer than second and third together

Sphragisticus

Dorsal parts entirely black, subshining; not pilose. Evenly and narrowly expanded lateral margins of pronotum impunctate.

Antennae nearly nude. Basal segment of posterior tarsus much longer than second and third together

Aphanus

Sphragisticus Stål.

S. nebulosus (Fallen).

Mon. Cicim. Suec., 65, 1807.

Often confused with *Peritrechus fraternus* but at once readily distinguished by the rather widely expanded, pale margins of the pronotum which are sparsely punctate and setose. The head, disk of anterior lobe of pronotum, scutellum for the most part, dull piceous-black. Posterior lobe of pronotum, two subapical spots on the scutellum and hemelytra for the most part, pale grayish. Second and third segments of antennae, apices of femora and tibia pale ferrugineous; basal and terminal segments of antennae, femora and some irregular spots posteriorly on the corium dark brown or piceous. Enlarged fore femora armed with a single prominent preapical spine between which and apex are two or three minute teeth. Tibia provided with short stiff bristles. Measures some 5 mm. long.

Occurs oftenly in cultivated fields along with such species as *Peritrechus fraternus*, *Emblethis vicarius* and *Nysius ericae*, etc.

Windsor, 18 July, 1904 (B. H. W.); Orange, 21 May, 1911 (B. H. W.).

Aphanus Laporte.

A. umbrosus (Distant).

Biol. Centr. Am., Heterop., i, 409, 1893.

A rather scarce but easily distinguished species by reason of its all black color and non-pilosity. 6-7 mm. long.

Wallingford, 5 June, 1912 (D. J. C.); Orange, 21 May, 1911 (B. H. W.); Windsor, 18 July, 1904 (B. H. W.).

Tribe GONIANOTINI.

Emblethis Fieber.

E. vicarius Horvath. (Pl. xvi, 31.)

Ann. Mus. Natl. Hung., vi, 563, 1908.

This is the only representative of the tribe in the United States. The widely laminate margins of the pronotum and hemelytra are concolorous with the general pale cinereous field and like it profusely punctate with fuscous. The rounded anterior angles of the pronotum extend well beyond the line of the eyes. Clavus not punctate in regular series. Anterior femora almost throughout armed with short teeth. Length 6 mm.

A common species in cultivated fields.

Lyme, 1 May, 1910 (A. B. C.); Waterford, 18 July, 1914 (I. W. D.); North Windham, 14 July, 1894 (A. P. M.) (H. M. P.); South Meriden, 5 March, 1915 (H. L. J.) (H. M. P.); Cornwall, 28 Nov., 1914 (K. F. C.).

Tribe LETHAEINI.

Key to Genera.

1. Anterior lobe of pronotum impunctate or obscurely punctate. Anterior tibia of males nearly straight and not abruptly expanded at apex. Antennae not decisely pilose, nearly nude 2
- Both lobes of the pronotum distinctly and closely punctate. Anterior tibia of males either strongly curved or abruptly bent and apically strongly expanded within. Antennae densely and finely pilose *Drymus*, p. 734
2. Dorsal parts not distinctly shining. Two lobes of pronotum demarked by a well pronounced groove. Anterior lobe of pronotum, head and scutellum black. Anterior margin of pronotum depressed and commonly pale, limited behind by a row of punctures; lateral lamellar expansion noticeably wider between the two lobes and there most commonly pale; unprovided with a seta near each anterior angle 3
- Dorsal parts distinctly shining. Pronotum not clearly separated into two lobes. Anterior disk of pronotum head and scutellum ferrugineous or castaneous. Anterior margin of pronotum not depressed; lateral edge of pronotum not widely expanded; provided with a long seta near each anterior angle 4

3. Species larger, commonly 6-7 mm. long. First segment of antenna longer, apex of tylus not reaching middle of this segment. Head longer than width back of eyes. Lateral margins of pronotum more or less pilose. Hind tibia either with short fine bristles or pilose *Eremocoris*, p. 735
- Species smaller, commonly 3-4 mm. long. First segment of antenna shorter, apex of tylus reaching at least to the middle of this segment. Head shorter, length subequal to width back of eyes. Lateral margins of pronotum without long soft hairs. Hind tibia almost nude *Scolopostethus*, p. 735
4. Pronotum with lateral margins acute, neither expanded nor pale, nearly straight; width across rounded anterior angles almost the diameter of head across eyes. Dorsal parts pilose. Fore femora provided with several minute, acute, preapical teeth. Membrane abbreviated. Only brachypterous forms known .. *Xestocoris*, p. 736
- Pronotum with lateral margins narrowly expanded and commonly pale, the two sides subparallel to the rounded anterior angles; diameter across rounded anterior angles much wider than head across eyes *Cryphula*, p. 736

Drymus Fieber.

D. crassus Van Duzee.

Trans. Am. Ent. Soc., xxxvi, 76, 1910.

A larger, darker and more coarsely punctate species than the following, measuring 6.5-7 mm. long. The lateral concolorous edges of the pronotum are generally straight and nearly parallel, abruptly rounded anteriorly. Both lobes of pronotum and hemelytra are nearly unicolorous dark brown and quite evenly and closely punctate. The costal margin of the hemelytra is rather widely expanded. The membrane is also darker in this species.

Usually found under boards, stones, etc., on the ground.

Brookfield, 27 July, 1910 (E. L. D.).

D. unus (Say).

Het. New Harm., 16, 1832.

Closely related to the preceding species *D. crassus* Van Duzee, but readily separated by relative differences. Paler and smaller species measuring some 5 mm. long. The lateral margins of the pronotum more strongly arcuately concave between the two lobes with these margins gradually rounding anteriorly from about the middle of the anterior lobe; the narrowly expanded lateral margins a little paler than the general surface. The anterior lobe darker and more finely punctate than posterior lobe. The costal margin of hemelytra more narrowly expanded and the whole surface anteriorly generally paler.

This species is found commonly by sifting dead leaves at the base of alders.

No record for the State is at hand but certain to be found there.

Eremocoris Fieber.**E. ferus** (Say). (Pl. xvi, 26.)

Het. New Harm., 16, 1832.

Head, anterior lobe and four fasciae on the posterior lobe of pronotum and scutellum piceous black. Lateral expansion of the pronotum, especially at the sinus between the lobes and nearly the anterior half of the hemelytra conspicuously pale. Three fasciae on posterior lobe of pronotum, posterior half of hemelytra dark castaneous. The membrane is brown with a conspicuous white spot at the outer basal angle and another opposite to it at the inner apical angle, sometimes also pale at inner basal angle. The femora are dark brown, with the tibia a little paler, the fore femora provided with a single enlarged preapical spine preceded and followed by several minute teeth. About 6 mm. long.

Oxford, 21 May, 1904 (W. E. B.); Orange, 21 May, 1911 (B. H. W.); Wallingford, 8 June, 1911 (B. H. W.).

Scolopostethus Fieber.

Three species, resembling small Eremocorids, occur in the east, all measuring around 3-3.5 mm. These are found commonly by sifting among dead leaves in damp situations.

Key to Species.

1. Hemelytra strongly fasciate with fuscous posteriorly, with surface of membrane often variegated with pale 2
Hemelytra not strongly fasciate with fuscous posteriorly, merely slightly embrowned. Membrane in both forms uniformly embrowned, surface not variegated with pale but with a conspicuous pale spot at outer basal angle and another at inner apical angle, with the inner basal angle sometimes pale. Lateral edge of pronotum nearly straight. Antenna with extreme apex of second, apical half of third and all of fourth segment embrowned. All femora pale. Fore femora with a single large spine nearer to middle than apex between which and apex are five or six minute teeth *diffidens*
2. Membrane marked with the white spots as in preceding, surface in the middle often more or less pale between the veins. Lateral edge of the pronotum nearly straight. Antenna with all of fourth and all of third except extreme base, embrowned. All femora most commonly pale with fore femora armed as in *diffidens atlanticus*. Membrane pale between the dark veins, without conspicuous pale spots at the angles in either form. Lateral edge of pronotum obviously concave. Antenna with apex of second, all of third and fourth segments embrowned. Most commonly fore femora more or less and posterior femora before apex, dark brown. Fore femoral spine preceded and followed by a few minute teeth *thomsoni*

S. diffidens Horvath.

Revue d'Ent., xii, 240, 1893.

Very distinct by reason of the less strongly contrasting colors of the hemelytra. Occurs commonly in both short and long-winged forms.

Not reported from the State but its known and recorded distribution should include it in its fauna.

S. atlanticus Horvath.

Revue d'Ent., xii, 240, 1893.

This occurs most commonly in the macropterous forms, in fact it may occur only in that form so far as my collection shows. Here as in the following species the hemelytra are strongly marked with fuscous posteriorly.

New Haven, 15 May, 1911 (A. B. C.).

S. thomsoni Reuter.

Ann. Soc. Ent. Fr., Ser. 5, iv, 562, 1874.

The brachypterous forms seem to be the more common. In the macropterous forms the membrane is pale throughout with brown veins, and in the brachypterous form the membrane does not extend beyond the apex of the hemelytra and generally is slightly pale only at the outer and inner basal angle. The lateral edge of the pronotum is more concave and the fore femora are generally dark brown and differently armed.

New Haven, 1 June, 1911 (B. H. W.), 27 July, 1904 (P. L. B.).

Xestocoris Van Duzee.

X. nitens Van Duzee.

Ent. News, xvii, 390, 1906.

A dark brown shining species, with the hemelytra slightly paler, coarsely and sparsely punctate. The pronotum is not separated into two lobes and except at anterior margin, impunctate; the lateral and posterior margins are straight, the former not at all expanded, the edge being merely acute. Membrane abbreviated, not extended beyond apex of hemelytra, its apex reaching to base of sixth abdominal segment. Dorsal parts quite pilose. Fore femora armed, preapically, with three small teeth. Last two segments of the antennae piceous black. 3-3.5 mm. long.

Collected in similar situations as *Scolopostethus*.

Lyme, 30 Apr., 1911 (A. B. C.); Hamden, 28 May, 1920 (P. G.).

Cryphula Stål.

C. parallelogramma Stål.

Enum. Hemip., iv, 165, 1874.

This is about the same length as but a little broader and less shining and pilose than the preceding. The posterior lobe of the pronotum is somewhat demarked from the anterior one by being slightly depressed and closely punctate. Its general dark castaneous-brown coloring is relieved by touches of pale yellow at the humeral angles of the pronotum and three spots on the scutellum. The slightly expanded lateral margins of the pronotum and the

corium more or less, particularly the veins, pale yellow. The antennae have the third and fourth segments brown. The enlarged fore femora are armed with three or four minute pre-apical teeth or tubercles, with two long setae between these and the middle. As in the preceding species a long seta is set near anterior angle of the pronotum.

This is another one of the species found commonly by sifting dead leaves or collected beneath stones, sticks, etc., on the ground. Brachypterous forms are more common.

New Haven, 26 Feb., 1911 (A. B. C.).

Family NEIDIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

A few species of moderate size and extremely attenuated shape, with long filiform appendages, the first antennal segment and femora clavate. Head constricted before eyes, which are distant from pronotum; ocelli present; antennae four-segmented, the fourth segment short and thick; rostrum long, four-segmented; scutellum very small; hemielytra composed of corium, clavus, and membrane, the latter with four or five veins; tarsi three-segmented. Male with a single large convex genital plate; female with two longitudinally divided genital segments. These insects are phytophagous and live on low herbage, often in the undergrowth of woods.

Key to Subfamilies.

Head elongate; vertex produced anteriorly in a long porrect process over the tylus	NEIDINAE
Head shorter; vertex without long process	METACANTHINAE

Subfamily NEIDINAE.

The species of this group are characterized by the long frontal process, and the coriaceous and punctate corium, which tapers gradually toward apex. One genus occurs in our region.

Neides Latreille.

Head above, pronotum, scutellum, and abdominal margins without spines; orificial canal slightly elevated; ventral surface of abdomen punctate. One species occurs within our limits.

N. muticus (Say).

Het. New Harm., 13, 1832.

Pale yellowish brown; eyes and fourth antennal segment dark brown; sternal region black; membrane with faint median dark streak. Form parallel. Length 7-9 mm. Taken by sweeping underbrush.

Meriden, 29 Apr., 1907 (B. H. W.); Woodbridge, 12 May, 1907 (W. E. B.); New Haven, 30 July, 1909 (B. H. W.).

Subfamily METACANTHINAE.

Vertex without a long anterior process, but sometimes acutely elevated, and separated from tylus by a deep impression; hemelytra membranous; pronotum globosely enlarged posteriorly. One genus occurs in our fauna.

Jalysus Stål.

Species of moderate size, having the corium impunctate, linear posteriorly; scutellum spinous; ventral surface of abdomen impunctate; orifices produced in free slender process visible from above. One species occurs in New England.

J. spinosus (Say).

Am. Ent., i, 14, 1824.

Reddish brown; eyes, fourth antennal segment, rostrum, and apex of corium dark brown; legs more or less dotted. Abdomen fusiform; body constricted at middle. Length 6-8 mm.

Taken by sweeping in meadows and woodland undergrowth.

New Haven, 4 Nov., 1903 (H. L. V.), 26 Feb., 1911, 11 May, 1911 (A. B. C.); North Haven, 3 Aug., 1905 (H. L. V.); Lyme, 5 Aug., 1911 (A. B. C.); Rainbow, 29 May, 1915 (B. H. W.); Bridgeport, 20 Sept., 1920 (B. H. W.).

Family ARADIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family, one of the most peculiar among the Hemiptera, contains insects of flattened form, living for the most part under the dead bark of trees. The head is horizontal, with the tylus greatly enlarged to accommodate the coiled trophic setae; rostrum four-segmented, the first scarcely visible; ocelli absent; antennae four-segmented; tarsi two-segmented.

Key to Subfamilies.

- Head narrowed behind eyes, eyes projecting strongly; trochanters connate with femora; abdominal spiracles placed near basal margin of each segmentARADINAE
 Head wider just behind eyes than immediately in front of them, eyes not projecting; trochanters free; spiracles midway between basal and apical margins of segmentsMEZIRINAE

Subfamily MEZIRINAE.

This group, in addition to the characters given in the key, is peculiar in lacking ventral sulcation, and in having the first antennal segment longer and gradually narrowed toward base. The species are often smooth and shining, and the rostrum is very rarely long enough to reach beyond the base of the head. One tribe occurs in our fauna.

Tribe MEZIRINI.

Species of small to moderate size, having the hemielytra flat, with basal coriaceous portion distinct from membrane; scutellum not extending beyond middle of abdomen.

Key to Genera.

1. Scutellum broadly rounded apically 2
Scutellum triangular **Aneurus**
2. Ventral abdominal segments with a distinct carina between the spiracles and the border; disk almost flat **Neuroctenus**
Ventral segments without carina; disk somewhat convex..... **Mezira**

Aneurus Curtis.

This genus includes rather small species with surface shining; the membrane is veinless and the fourth antennal segment is long.

Key to Species.

1. Second antennal segment shorter than the first; size small, length about 4 mm. **fiskei**
Second antennal segment not shorter than first; larger, length about 5.3 mm. 2
2. Antennae moderately stout, the fourth segment a little longer than the third **inconstans**
Antennae slender, the fourth segment more than twice as long as the third **simplex**

A. fiskei Heidemann.

Proc. Ent. Soc. Wash., vi, 164, 1904.

This is a small species often found under loose bark of living shagbark hickory and under dead hardwood bark; it has also been taken under sycamore and sourwood bark.

Brookfield, 27 July, 1910 (E. L. D.).

A. inconstans Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 105, 1871.

A common species, frequently met with under dead bark of maple, oak, and other trees, usually saplings.

Lyne, 14 May, 1911 (A. B. C.); New Canaan, 5 Sept., 1918 (B. H. W.); 6 Sept., 1918 (M. P. Z.); North Haven, 4 June, 1917 (M. P. Z.); Portland, 29 May, 1915 (F. W. Haasis); Hamden, 25 May, 1920 (P. G.); Orange, 25 May, 1920 (B. H. W.); Cornwall, 5 June, 1921 (B. H. W.), 17 July, 1921 (M. P. Z.).

A. simplex Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 106, 1871.

An extremely rare species known only from Vermont and Massachusetts.

Neuroctenus Fieber.

Species of moderate size, with minutely granulated surface; the membrane has distinct veins and the fourth antennal segment is not distinctly longer than the third. The most striking generic

character is the longitudinal carina near the lateral margins of the ventral abdominal segments. A single species occurs in New England.

N. simplex Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., i, 323, 1876.

A rare species in New England.

Branford, 6, 26 Apr., 1921 (M. P. Z.).

Mezira Amyot and Serville.

This genus includes rather large species, usually very dark in color and with coarsely granulated surface; first antennal segment not extending beyond apex of tylus; membrane with distinct veins; abdomen moderately convex ventrally. Two species of generally southern and western distribution may yet be found in New England.

- | | |
|--|------------------------|
| Lateral margin of pronotum acutely emarginate; length about 9 mm. | lobata (Say) |
| Lateral margin of pronotum sinuate; length about 6 mm. | granulata (Say) |

Aradus Fabricius.

This is a very large yet perfectly natural genus, containing in all about 130 species, for the most part confined in their distribution to the northern hemisphere. The chief generic characters are as follows: form flattened, the surface more or less roughly granulate; a small spine or tubercle placed anteriorly and obliquely inward near the eyes; pronotum with six longitudinal carinae, the lateral pair very short; hemielytra usually shorter and narrower than abdomen, often greatly abbreviated or narrowed. The following key includes the species occurring in New England or nearby and it will serve to locate most of the forms with a fair degree of certainty; in doubtful cases reference may be had to my recent "Essay" on the genus, where full descriptions and detailed figures are given.*

Key to Species.

- | | |
|--|------------------------|
| 1. Rostrum extending beyond base of head; lateral margins of pronotum more or less explanate (Subgenus <i>Aradus</i>) | 2 |
| Rostrum not reaching base of head; lateral margins of pronotum not explanate (Subgenus <i>Quilnus</i> Stål) | 26. niger |
| 2. Median carinae of pronotum slightly developed, obsolete anteriorly; antennae scarcely longer than head | 25. cinnamomeus |
| Median carinae distinct, extending to anterior margin; antennae longer | 3 |
| 3. Second antennal segment about as long as third, both slender and cylindrical; length more than 8 mm. | 4 |

* Transactions American Entomological Society, xlvii, 1, 1921.

- Second segment generally distinctly longer than the third, one or both often not cylindrical 5
4. Lateral margins of abdomen almost entire; pronotum widest slightly behind middle **1. aequalis**
Lateral margins strongly crenate; pronotum widest well before middle **2. crenatus**
5. Third antennal segment enlarged, about one-half thicker than second; length about 8 mm. **3. quadrilineatus**
Third antennal segment slightly if at all thicker than second 6
6. Antennae very robust, at the widest point most distinctly thicker than front femora 7
Antennae more slender, often cylindrical, not or but slightly thicker than front femora 10
7. Pronotum with three conspicuous polished black areas behind middle; hemielytra and abdomen pale **4. ornatus**
Pronotum without such areas 8
8. Scutellum pentagonal, the sides moderately elevated; color almost uniform dark brown **5. robustus**
Scutellum triangular, sides higher; coloration variegated 9
9. Pronotum widest behind middle; sides of scutellum at middle lower than transverse basal elevation **6. duzei**
Pronotum widest at middle; sides of scutellum strongly raised, higher than basal elevation **7. implanus**
10. Antero-lateral margins of pronotum distinctly serrate, never deeply sinuate; corium (macrop.) always strongly dilated at base, never straight laterally 11
Antero-lateral margins of pronotum entire, sometimes evenly granulate, often deeply sinuate; corium dilated or not dilated at base 18
11. Second antennal segment cylindrical, at least in basal half 12
Second segment distinctly clavate, evenly enlarging from base or suddenly enlarged in apical third 14
12. Pronotum widest at middle; sides of abdomen rather strongly crenate **10. consors**
Pronotum widest well behind middle; sides of abdomen entire or notched 13
13. Granulation of head rough; sides of pronotum usually straight, oblique, with variably coarse teeth **8. proboscideus**
Granulation of head fine, smooth; sides of pronotum slightly arcuate, with very fine irregular teeth **9. basalis**
14. Length of second antennal segment about equal to distance between eyes **11. similis**
Length of second segment at least equal to head width including one eye 15
15. Second antennal segment not or scarcely three times as long as third 16
Second segment distinctly more than three times as long as third 17
16. Color grayish, with obscure yellowish markings and a distinct pattern of pale granules; sides of pronotum with a few large teeth anteriorly **13. acutus**
Color black; sides of pronotum with numerous fine teeth **12. shermani**
17. Second antennal segment gradually and evenly enlarged from base **14. inornatus**
Second segment cylindrical in basal half, strongly enlarged in apical third **15. approximatus**
18. Corium strongly dilated at base, width of hemielytra at this point usually distinctly greater than width of pronotum 19
Corium slightly or not dilated at base, width about equal to that of pronotum 22

19. Third antennal segment pale 20
 Third segment concolorous 21
 20. Pronotum widest behind middle17. *insignitus*
 Pronotum widest before middle18. *uniformis*
 21. Pronotum widest well behind middle16. *borealis*
 Pronotum widest near middle19. *tuberculifer*
 22. Scutellum distinctly pentagonal, broad, sides very strongly and
 sharply elevated, parallel in basal half; length about 6 mm. or
 more20. *funestus*
 Scutellum otherwise; length less than 6 mm. 23
 23. Third antennal segment about two-thirds as long as second; male
 genital plate fenestrate24. *falleni*
 Third antennal segment usually not more than one-half as long as
 second; male plate entire 24
 24. Antennae moderately robust, the second segment strongly narrowed
 in basal third21. *lugubris*
 Antennae slender, the second segment slightly and gradually
 enlarged from near base 25
 25. Antennae with two white bands; pronotum widest well behind
 middle22. *abbas*
 Antennae with one white band; pronotum widest slightly behind
 middle23. *uniannulatus*

1. *A. aequalis* Say.

Het. New Harm., 29, 1832.

Brown, with yellowish markings; length 8.4-10 mm. A rare species recorded from Maine and Vermont.

2. *A. crenatus* Say.

Het. New Harm., 28, 1832.

Brown, with darker markings, antennae and legs yellowish; pronotum widely explanate before middle; abdomen strongly crenate laterally; length 8-11 mm. Not as yet reported from New England although it occurs in Quebec, Ontario, and New York.

3. *A. quadrilineatus* Say. (Pl. xviii, 40.)

Jour. Acad. Nat. Sci. Phila., iv, 326, 1825.

Dark brown to black, apex of second antennal segment pale, legs annulate; length 7.5-9 mm. A common species readily recognized by antennal characters.

Lyme, 29 May, 1910, 30 Apr., 1911 (A. B. C.); Saybrook, 25 Apr., 1913 (D. J. C.); Hartford, 11 May, 1914 (W. M.); South Meriden, 10 May, 1914 (H. L. J.).

4. *A. ornatus* Say.

Het. New Harm., 29, 1832.

A rare and very beautiful species recorded from Pennsylvania, Maryland, etc., but not found as yet within our limits. Dark brown, hemielytra and abdomen pale; length 5.4-6.3 mm.

5. *A. robustus* Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 104, 1871.

Nearly uniform dark brown; length 5.5-7 mm. A common species with very thick antennae and broad pronotum. The variety *insignis* Parshley has the corium, apex of scutellum, and postero-lateral margins of pronotum yellowish.

Meriden, 10 May, 1910 (A. B. C.); New Haven, 26 Feb., 1911 (A. B. C.); 21 May, 1911 (W. E. B.); Stonington, May, 1914 (I. W. D.) (M. P. Z.); Rainbow, 7 May, 1914 (M. P. Z.); Milford, 25 May, 1920 (P. G.); Hamden, 20 May, 1920 (M. P. Z.); Orange, 12 May, 1920 (M. P. Z.); East Haven, 10 May, 1921 (B. H. W.).

6. **A. duzeei** Bergroth.

Proc. Ent. Soc. Wash., ii, 333, 335, 1892.

Dark brown, brightly variegated with yellow; length 6-6.7 mm. Recorded from Massachusetts, New York, etc., but not yet taken in Connecticut.

7. **A. implanus** Parshley.

Trans. Amer. Ent. Soc., xlvii, 45, 1921.

This species, which has often been confused with *duzeei*, is to be distinguished by its thicker antennae, higher scutellar margins, etc. Brown, with yellow markings, length 5.8-6.3 mm. Not yet found in New England, though it occurs in eastern Canada, Pennsylvania, etc.

8. **A. proboscideus** Walker.

Cat. Hem.-Het. Brit. Mus., vii, 35, 1873.

Light, or rarely dark, brown, with very variable paler markings; length 6-9.7 mm. This is one of the most variable species of the genus, but specimens can usually be determined without doubt by the characters given in the key. *A. hubbardi* Heidemann is a synonym. It is recorded from several of the New England states, but seems to be confined to boreal conditions.

9. **A. basalis** Parshley.

Trans. Amer. Ent. Soc., xlvii, 54, 1921.

Brown, with paler markings; length 7-8.3 mm. Closely related to the preceding. Known from Maine, New Hampshire, and New York.

10. **A. consors** Parshley.

Trans. Amer. Ent. Soc., xlvii, 56, 1921.

Grayish brown, with obscure darker and lighter markings; length 7.6 mm. Known from one specimen only, taken many years ago in Massachusetts.

11. **A. similis** Say.

Het. New Harm., 28, 1832.

Pale to dark brown, third antennal segment pale; length 5-8.5 mm. A very common and variable species, especially distinguished by its short second antennal segment. The variety *centriguttatus* Bergroth has the third antennal segment colorous.

Meriden, 8 May, 1911 (A. B. C.); Stonington, May, 1914 (I. W. D.).

12. **A. shermani** Heidemann.

Proc. Ent. Soc. Wash., viii, 68, 1907.

Black; length 6.8-8.8 mm. Reported from Maine, Quebec, etc., and probably occurs in Connecticut, since the range extends south to Georgia.

13. *A. acutus* Say.

Het. New Harm., 28, 1832.

Dark brown, with dull yellowish markings and pale granules arranged in a distinct pattern; length 7-9.6 mm. A locally common species of wide distribution, occurring in Maine and New Hampshire but not as yet found in Connecticut.

14. *A. inornatus* Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., i, 323, 1876.

Almost uniform light to dark brown; length 8.5-10 mm. A rare species widely distributed in the east, but not yet found in Connecticut.

15. *A. approximatus* Parshley.

Trans. Amer. Ent. Soc., xlvii, 72, 1921.

Light grayish brown, with a vague pattern of pale granules; length 8-11 mm. Reported from Maine, New York, etc.; readily recognized by the abruptly clavate second antennal segment.

16. *A. borealis* Heidemann.

Proc. Ent. Soc. Wash., xi, 190, 1909, fig. 4.

Blackish brown, with reddish yellow markings; length 6.6-8 mm. Occurs in Maine, New Hampshire, and across Canada.

17. *A. insignitus* Parshley.

Trans. Amer. Ent. Soc., xlvii, 75, 1921.

Black, the third antennal segment orange-yellow; length 5 mm. Known from a single specimen taken in Massachusetts.

18. *A. uniformis* Heidemann.

Proc. Ent. Soc. Wash., vi, 231, 1904.

Black, third antennal segment and spots on connexivum yellowish; length 4.7-5.5 mm. Occurs in Massachusetts, New York, and southward.

19. *A. tuberculifer* Kirby.

In Richardson, Fauna Bor.-Amer., iv, 278, 1837, pl. 6, fig. 5.

Black, with pale markings on corium and connexivum; length 6.5-7.3 mm. A rare species reported from Maine, Long Island, N. Y., etc., easily recognized by the form of the second antennal segment which is clavate in apical half, etc.

20. *A. funestus* Bergroth.

Can. Entom., xlv, 4, 1913.

Black, slightly marked with obscure yellow; length 5.7-8 mm. A northern and western species, which may yet be found in New England.

21. *A. lugubris* Fallén.

Mon. Cim. Suec., 34, 1907.

Black, one or two rings on antennae and connexival spots dull white; length 4.5-6.4 mm. This is a common species of enormous range over the entire continent as well as the Palaearctic Region, but no specimens happen to have been taken as yet in Connecticut. The variety *nigricornis* Reuter lacks the white rings on the antennae.

22. *A. abbas* Bergroth.

Bull. Soc. Ent. Belg., p. clxxx, 1889.

Black, antennae biannulate with white, connexivum with yellowish white spots, exocorium with a small translucent spot at base; length 4.6-5.9 mm. A striking and widely distributed species.

New Haven, 31 July, 1911 (A. B. C.); 24 May, 1914 (W. E. B.); 24 Apr., 1915 (Q. S. L.); 18 June, 1919 (M. P. Z.); Wallingford, 18 July, 1910 (W. E. B.); June, 1912 (D. J. C.).

23. *A. uniannulatus* Parshley.

Trans. Amer. Ent. Soc., xlvii, 90, 1921.

Black, apex of third antennal segment and connexival spots pale yellowish; length 4.2-5 mm. This species is known from Long Island, N. Y., District of Columbia, etc., and probably occurs in New England.

24. *A. falleni* Stål.

Rio Jan. Hem., i, 68, 1860.

Black, antennae usually pale brown, cells of corium whitish hyaline, connexivum spotted with yellowish white; length 3.75-5 mm. This species is very widely distributed, occurring over most of North and South America. It may be recognized by the short, clavate second antennal segment and the peculiar fenestrate male genital segment.

New Haven, 18 June, 1919 (M. P. Z.).

25. *A. cinnamomeus* Panzer.

Fauna. Ins. Germ., Heft 100, 20, 1794.

Yellowish or reddish brown; length 3.1-5 mm. This species is polymorphic, having a narrow-winged (stenopterous) male, short-winged (brachypterous) female, and fully winged (macroppterous) female. It is widely distributed and a specimen has recently been found in Massachusetts, but none as yet in Connecticut.

26. *A. niger* Stål.

Enum. Hem., 3, 137, 1873.

Black, the connexivum vaguely spotted; length 5-6.5 mm. Commonly found under dead pine bark. Long- and short-winged forms occur. It is reported from several New England states, New York, etc., but not as yet from Connecticut.

Family COREIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This very extensive family is represented in our northern region by but few species, which are mostly of large size and dull coloration. They feed largely on vegetation and in some cases, such as the three squash bugs, are important agricultural pests. As restricted here, the family has the following characters: head very small; bucculae extending behind insertion of antennae; ocelli present; antennae with four true segments; membrane with numerous veins; fourth and fifth dorsal abdominal segments concavely sinuate at base; metasternal orifices distinct; posterior coxal cavities very deeply excised from the metasternum, their outer margins almost or quite parallel with longitudinal axis. The male has a single convex genital plate; the female several smaller plates separated by distinct sutures.

Key to Subfamilies.

Hind tibiae armed below at apex with a spine or tooth ... MEROCORINAE
Hind tibiae unarmed at apex COREINAE

Subfamily MEROCORINAE.

This subfamily is represented in North America by one genus, containing two species of which one is confined to the extreme south.

Merocoris Perty.*Corynocoris* Mayr.*M. distinctus* (Dallas). (Pl. xviii, 36.)

List of Hemip., ii, 419, 1852.

Finely and thickly pubescent; hind tibia clavate, long and curved, armed with a few strong spine-like teeth; color grayish brown, membrane and corial spots darker, length 8-9 mm.; found by sweeping weeds, or sometimes about carrion.

Litchfield, 21 Sept., 1901 (L. B. W.); New Haven, 26 June, 1902 (E. J. S. M.), 19 and 20 July, 1905 (B. H. W.); Scotland, 27 July, 1904 (B. H. W.); Meriden, 6 July, 1915 (H. L. J.); New Canaan, 17 Sept., 1918 (B. H. W.).

Subfamily COREINAE.

This subfamily includes a majority of the Coreids; the hind tibiae are without apical tooth; the antennae generally slender, often with modified segments; and the body is seldom strongly pubescent.

Key to Tribes.

- i. Hind femora spinous or tuberculate, generally much enlarged, especially in the males; antennal tubercles large, separated by a space generally less than their own width 2

- Hind femora not greatly enlarged, rarely spinous, in which case antennal tubercles are moderate in size and separated by a space greater than their own width 3
2. Tylus deflexed, not projecting much if any before antennal tubercles MICTINI
Tylus not deflexed, extending much before antennal tubercles ACANTHOCEPHALINI
3. Posterior tibiae not dilated 4
Posterior tibiae dilated ANISOSCELINI
4. Antennal tubercles large and prominent, close together, extending much beyond apex of tylus; lateral angles of thorax produced in an acute spine; third antennal segment expanded and flattened .. CHARIESTERINI
- Antennal tubercles moderate in size, distant, not extending beyond apex of tylus; lateral angles of thorax not spined; third antennal segment cylindrical in adults COREINI

Tribe ACANTHOCEPHALINI.

Acanthocephala Laporte.

A. terminalis (Dallas). (Pl. xviii, 33.)

List of Hemip., ii, 431, 1852.

Color brown, terminal segment of antennae paler; length 18-23 mm.

Stamford, 13 Aug., 1891 (A. P. M.); New Haven, 22 July, 1909 (B. H. W.), 4 June, 1911 (W. E. B.), 3 Aug., 1909 (B. H. W.); New Canaan, 5 Sept., 1914 (M. P. Z.), 21 Sept., 1909 (B. H. W.); Greenwich, 5 Oct., 1909 (A. I. Bourne); Manchester, 30 Aug., 1912 (D. J. C.); North Branford, 8 June, 1912 (B. H. W.); Portland, 14 Aug., 1913 (B. H. W.); Meriden, 6 June, 1914 (H. L. J.); Brookfield, 30 Aug., 1914 (W. M.); South Meriden, 6 June, 1914 (H. L. J.).

Tribe ANISOSCELINI.

This tribe is typically southern, but three species of one genus may possibly be found in Connecticut.

Leptoglossus Guérin.

Key to Species.

1. Pronotum rugose, irregularly punctate; hemielytra without white band; color brown, antennae and anterior legs pale; length 18-21 *fulvicornis*
- Pronotum smooth, regularly punctate; hemielytra with band 2
2. White band of hemielytra zigzag; outer foliation of hind tibiae evenly rounded, but little wider than inner; color brown; length about 19 mm. *corculus*
- White band straight; outer foliation scalloped, wide; color brown; length about 18 mm. *phyllopus*

L. fulvicornis (Westwood), *magnoliae* Heidemann.

Hope Cat., ii, 17, 1842.

This species has been taken in Massachusetts.

L. phyllopus (Linnaeus).

Syst. Nat., Edn. 12, i, 731, 1767.

L. corculus (Say).

Het. New Harm., 12, 1832.

New Haven, 17 June, 1922 (W. E. B.); New Canaan, 5 Sept., 1922 (M. P. Z.).

Tribe **MICTINI**.*Key to Genera.*

- Antennal tubercles produced at the anterior lateral angle in an exterior spine or tooth; head with a distinct rounded protuberance or callus behind the eyes; antennae glabrous **Euthochtha**
 Antennal tubercles without an exterior projection; head without a callus; antennae pilose **Archimerus**

Archimerus Burmeister.**A. alternatus** (Say).

Jour. Acad. Nat. Sci. Phila., iv, 317, 1825.

Color brown; connexivum spotted; length about 20 mm.

May yet be found in Connecticut.

Euthochtha Mayr.**E. galeator** (Fabricius). (Pl. xviii, 31.)

Syst. Rhyng, 191, 1803.

Color brown, connexivum spotted; length 13-17 mm.; nymph spinous, with third antennal segment enlarged and flattened.

Stamford, 22 Aug., 1894 (A. P. M.), 4 June, 1912 (H. B. K.); New Haven, 3 July, 1902 (W. E. B.), 5 June, 1910 (A. B. C.), 8 Sept., 1910 (W. E. B.); Mount Carmel, 13 June, 1909 (W. E. B.); Southington, 12 July, 1910 (W. E. B.); Manchester, 12 Sept., 1910 (W. E. B.), 13 Sept., 1910 (D. J. C.); Lyme, 4 July, 1911 (H. B. K.) (A. B. C.); Hamden, 9 June, 1911 (W. E. B.); Portland, 14 Aug., 1913 (B. H. W.); Yalesville, 23 June, 1913; Brookfield, 30 Aug., 1914 (W. M.); Farmington, 6 Sept., 1914 (W. M.); Meriden, 27 Apr., 1915 (H. L. J.); Cornwall, 28 July, 1918 (K. F. C.).

Tribe **CHARIESTERINI**.**Chariesterus** Laporte.**C. antennator** (Fabricius).

Syst. Rhyng., 198, 1803.

Color light grayish brown, membrane and expanded third antennal segment darker; length about 12 mm.

Not found as yet in New England.

Tribe **COREINI**.**Anasa** Amyot and Serville.

1. Head without prominent spines 2
 Head armed behind the insertion of the antennae with two prominent spines projecting anteriorly beyond the apex of the antennal tubercles; color dark brown with indefinite paler markings; membranous suture generally marked with a pale line, connexivum spotted; length 11-14 mm. **armigera**

2. Head with a tubercle behind the base of each antenna; color dark brown, lateral margins and median line of head and thorax paler, antennae concolorous, connexivum spotted; length 14-17 mm. .. **tristis**
 Head without tubercles; color light brown, with black markings, apical antennal segment paler, connexivum spotted; length about 14 mm. **repetita**

A. armigera (Say).

Jour. Acad. Nat. Sci. Phila., iv, 319, 1825.

Occurs in Massachusetts and to the south and west.

New Haven, 26 June, 1919 (K. F. C.).

A. tristis (DeGeer). (Pl. xviii, 35; eggs, Pl. xix, 3.) Squash bug.

Memoires, iii, 340, 1773.

The common and destructive species.

New Haven, 13 July, 1900, 26 March, 16 Oct., 1915, North Haven, 11 Sept., 1915 (W. E. B.), 17, 20, 21, 22 July, 1903, 29 Sept., 1902, 31 July, 1908, 16 Oct., 1908 (B. H. W.), 7 May, 1913, 25 July, 1914 (M. P. Z.); 14 Apr., 1919 (W. E. B.); Westville, 29 May, 1902, 19 Sept., 1904, 26 March, 1905 (W. E. B.); Manchester, 12 Sept., 1910, Berlin, 16 Sept., 1915 (W. E. B.); Wallingford, 16 June, 1911 (J. K. L.); Hamden, 24 June, 1913 (E. M. Stoddard).

A. repetita Heidemann. (Pl. xviii, 34.)

Proc. Ent. Soc. Wash., vii, 11, 1905.

Wallingford, 1911 (D. J. C.); New Haven, 12 June, 1915 (W. E. B.).

Family ALYDIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This and the following family are groups of moderate extent, which have often been treated as subfamilies of the Coreidae. I believe that Reuter was correct in giving them independent rank, which is based on distinctness in habitus as well as in detailed characters. Aside from the characters mentioned in the key, the Alydidae have the posterior coxal cavities not very deeply excised from the metasternum; fourth and fifth dorsal abdominal segments concavely arcuate at base; and the copulatory apparatus of the male exposed.

Key to Tribes.

Head not constricted behind eyes, as wide as apex of prothorax;
 juga bifid at apex **Micrellytrini**
 Head distinctly constricted behind eyes; juga entire at apex .. **Alydini**

Tribe MICRELYTRINI.

Protenor Haglund.

P. belfragei Haglund. (Pl. xviii, 37.)

Stett. Ent. Zeit., xxix, 162, 1868.

Color light brown; length about 15 mm.

Scotland, 10 Aug., 1905 (B. H. W.); Westville, 9 Aug., 1906 (B. H. W.); New Haven, 14, 20 July, 1908, 11 Aug., 1908 (B. H. W.), 30 July, 1911 (A. B. C.).

Tribe ALYDINI.

Key to Genera.

1. Hind tibiae without spines 2
Hind tibiae armed with numerous spines **Stachyocnemus**
2. First antennal segment about equal to or shorter than the second .. 3
First antennal segment longer than the second **Megalotomus**
3. Orifices obsolete; posterior femora extending beyond apex of abdomen **Tollius**
Orifices distinct, produced laterally; posterior femora scarcely extending beyond apex of abdomen **Alydus**

Megalotomus Fieber.

M. quinquespinosus (Say). (Pl. xviii, 32.)

Jour. Acad. Nat. Sci. Phila., iv, 323, 1824.

Color clear brown; fourth antennal segment black apically; length about 15 mm.

New Haven, 19 July, 1905 (B. H. W.), 9 July, 1914, 6 July, 1915 (M. P. Z.); Branford, 28 July, 1905 (H. L. V.); Granby, 3 Oct., 1905 (B. H. W.); Darien, 4 Aug., 1908 (C. W. J.); Woodbury, 19 July, 1913 (W. E. B.); Portland, 15 Aug., 1913 (B. H. W.); Meriden, 16 Aug., 1913 (H. L. J.); Greenwich, 9 Oct., 1918 (M. P. Z.); Canaan, 18 Aug., 1894 (A. P. M.).

Alydus Fabricius.

Key to Species.

1. Lateral margins of pronotum concolorous; lateral angles blunt .. 2
Lateral margins with a pale raised line; lateral angles acute; color light brown; length 10-12.5 mm. **pilosulus**
2. Membrane usually finely spotted; pronotum usually brown posteriorly; claspers of male arcuate; lateral genital plates of female rounded at apex; length 10-11.5 mm. **conspersus**
Membrane unspotted; pronotum usually black; claspers of male not arcuate, twisted; lateral plates acute; length 10.5-12 **eurinus**

A. conspersus Montandon.

Proc. U. S. Nat. Mus., xvi, 49, 1893.

Not as yet recorded from Connecticut.

A. eurinus (Say). (Pl. xviii, 39.)

Jour. Acad. Nat. Sci. Phila., iv, 324, 1824.

New Haven, 17, 24 June, 1902 (E. J. S. M.), 5 June, 1910 (A. B. C.); Yalesville, 19 Oct., 1903 (H. L. V.); Thompson, 11 July, 1905 (H. L. V.); Westville, 15 July, 1905 (W. E. B.); North Haven, 3 Aug., 1905 (B. H. W.); Farmington, 6 Sept., 1914 (W. M.); Meriden, 4 July, 1915 (H. L. J.); Kent, 10 Aug., 1918 (M. P. Z.); Cornwall, 11 July, 23 Sept., 1920 (K. F. C.); Westport, 24 June, 1921 (W. E. B.).

A. pilosulus Herrich-Schaeffer. (Pl. xviii, 38.)

Wanz. Ins., viii, 101, 1848.

New Haven, 24, 27, 28 June, 1902 (E. J. S. M.), 12 July, 1905

(B. H. W.), 7 Aug., 1905, 23 Aug., 1906 (W. E. B.), 8 June, 1911 (A. B. C.), Sept., 1915 (M. P. Z.); Mount Carmel, 4 Nov., 1902 (E. J. S. M.); Westville, 2 July, 1904 (W. E. B.); Scotland, 25 July, 1904 (B. H. W.); Branford, 19 Sept., 1904 (H. W. W.), 28 July, 1905 (H. L. V.); Poquonock, 27 June, 1905 (H. L. V.); Rockville, 23 Aug., 1905 (H. L. V.); Farmington, 6 Sept., 1914 (W. M.); Clintonville, 27 Sept., 1915 (W. E. B.); Stamford, 13 Aug., 1891 (A. P. M.).

Tollius Stål.

T. curtulus (Stål).

Freg. Eug. Resa. Ins., 234, 1859.

Not found in New England as yet.

Stachyocnemus Stål.

S. apicalis (Dallas).

List of Hemip., ii, 479, 1852.

Dark brown; length about 9 mm.

Not found in New England as yet.

Family CORIZIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family includes small species of distinct facies, having only the fourth abdominal segment concavely sinuate at base; the external genitalia are usually concealed by laminate extensions of the sixth segment, called the dorsal and ventral genital plates, and the sixth ventral segment in the female is not divided longitudinally.

Key to Tribes.

Anterior angles of prothorax projecting forward in an acute spine;
hind femora thickened and spinous **Harmostini**
Anterior angles of prothorax obtuse or rounded; hind femora not
much thickened, without spines **Corizini**

Tribe HARMOSTINI.

Harmostes Burmeister.

H. reflexulus (Say). (Pl. xviii, 30.)

Het. New Harm., 10, 1832.

Lateral margins of thorax entire; first antennal segment projecting distinctly beyond apex of head; color variable from pale yellow or greenish to dark brown; length 7.5-8.5 mm.

New Haven, 24 June, 1902 (E. J. S. M.), 20 July, 1908 (B. H. W.), 23 July, 1910, 30 May, 18 June, 1911 (B. H. W.), 30 March, 1912 (W. E. B.); North Haven, 3 Aug., 1905 (H. L. V.); Brookfield, 27 July, 1910 (E. L. D.); Wallingford, 8 June, 1911 (B. H. W.); Middlebury, 16 June, 1911 (B. H. W.); North Branford, 8 June, 1912 (B. H. W.); Portland, 9, 12, 15 Aug., 1913 (B. H. W.).

Tribe **CORIZINI.****Corizus** Fallén.*Key to Species.*

1. Transverse suture not looped; posterior lateral angles of metapleura produced into an acute rounded angle; generally under 6 mm. 2
 Transverse suture of pronotum looped at each end; posterior lateral angles of metapleura not much produced posteriorly, obtuse; color brownish gray above, yellowish gray below, ornamented with variable darker markings; connexivum spotted; length 6-8.5 mm. **crassicornis**
2. Scutellum narrow and acute apically, generally constricted at middle; sometimes not especially acute, in which case the sides are nearly straight, without constriction at middle; pubescence less prominent; colors generally light; length 5 mm. or more ... 3
 Scutellum broad and rounded apically, distinctly constricted at middle; body thickly pubescent; color dark brown, hemelytra milky white, veins of the corial region darker; size small, length 4-4.5 mm. **hirtus**
3. Scutellum constricted at middle, sides concave; transverse suture less prominent; lateral margins of pronotum not pale, or narrowly so 4
 Scutellum not constricted at middle, sides nearly straight; transverse suture of pronotum prominent and black; pronotum distinctly pale laterally; wings extending much beyond apex of abdomen; color above yellow, red, or sometimes very dark, ornamented with darker markings; sternum black; connexivum not distinctly spotted; length 5.5-6.4 mm. **hyalinus**
4. Sides of head angulate at anterior inner corner of eyes; tylus more expanded apically; ventral plate of genitalia, viewed laterally, with distinct posterior angles, posterior margin concave in the male; dorsal plate expanded apically in male; rounded in female; connexivum generally unspotted; disk of abdomen usually ornamented with three small central dark spots; general color usually pale yellow or red with darker markings; length 5-6 mm. **lateralis**
 Sides of head nearly straight; tylus less expanded; ventral plate of genitalia almost without posterior angles; not distinctly concave in male; dorsal plate rounded in male; pointed in female; connexivum generally spotted; disk of abdomen generally ornamented with a pale x-shaped mark; general color dark red or brown with darker markings; length 5-6 mm. **bohemani**

C. bohemani Signoret.

Ann. Soc. Ent. Fr., Ser. 3, vii, 86, 1859.

Scotland, 30 July, 1904, 8 Aug., 1905 (B. H. W.); New Haven, 9 June, 1905, 1 June, 1911 (B. H. W.); Meriden, 28 July, 1909 (A. I. B.); North Branford, 2 June, 1921 (M. P. Z.).

C. crassicornis (Linnaeus).

Syst. Nat., Edn. 10, i, 448, 1758.

This species has been recorded from Maine, New Hampshire, Vermont and Massachusetts, but has not yet been taken in Connecticut.

C. hirtus Bueno.

Ent. News, xxiii, 217, 1912.

This species occurs in Massachusetts, but has not yet been recorded from Connecticut.

C. hyalinus (Fabricius).

Ent. Syst., iv, 168, 1794.

Occurs in Massachusetts but not yet recorded from Connecticut.

C. lateralis (Say). (Pl. xviii, 29.)

Jour. Acad. Nat. Sci. Phila., iv, 320, 1825.

Scotland, 25 July, 1904 (B. H. W.); Branford, 28 July, 1905 (H. W. W.); Yalesville, 16 Oct., 1906 (W. E. B.); New Haven, 5 Nov., 1910 (D. J. C.); 26 June, 1910 (B. H. W.); Orange, 21 May, 1911 (B. H. W.); Meriden, 24 May, 1914 (H. L. J.); Cornwall, 17 July, 1921 (M. P. Z.).

Family PENTATOMIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This is one of the largest families of the Hemiptera and the species are usually recognizable at once by their peculiar and characteristic habitus, although very diversified in size, coloration, and habits. The scutellum is large, always extending at least to the base of the membrane and in a few cases almost entirely covering the abdomen as in the Scutelleridae, and is provided with lateral grooves or frena which are sometimes very short. The sexes are easily distinguished by an examination of the external genitalia, which in the male consist of an array of curiously formed hooks, etc., covered wholly or partially, when at rest, by a single or rarely double convex genital plate; in the female there are several smaller plates accurately fitted together. The terminology used is illustrated in figs. 168 and 169.

Key to Subfamilies.

1. First segment of the rostrum largely free, relatively short and thick; bucculae small, more or less distinctly united under the rostrum posteriorly, hence converging; insertion of rostrum close to end of tylus ASOPINAE, p. 770
- First segment of rostrum largely embedded between the bucculae, relatively slender; bucculae large, not united posteriorly, hence more or less parallel; insertion of rostrum separated from tylus by a space about equal to width of basal segment (Pentatominae Kirk.) 2
2. Tarsi two-segmented; sternum with a distinct longitudinal keel; frena extending almost to end of scutellum ACANTHOSOMATINAE, p. 769
- Tarsi three-segmented; sternum without keel; frena shorter 3
3. Scutellum large, broad at apex, extending farther posteriorly than the corium; frena very short GRAPHOSOMATINAE, p. 754
- Scutellum smaller, more or less narrowed apically, generally shorter than the corium; frena longer PENTATOMINAE, p. 755

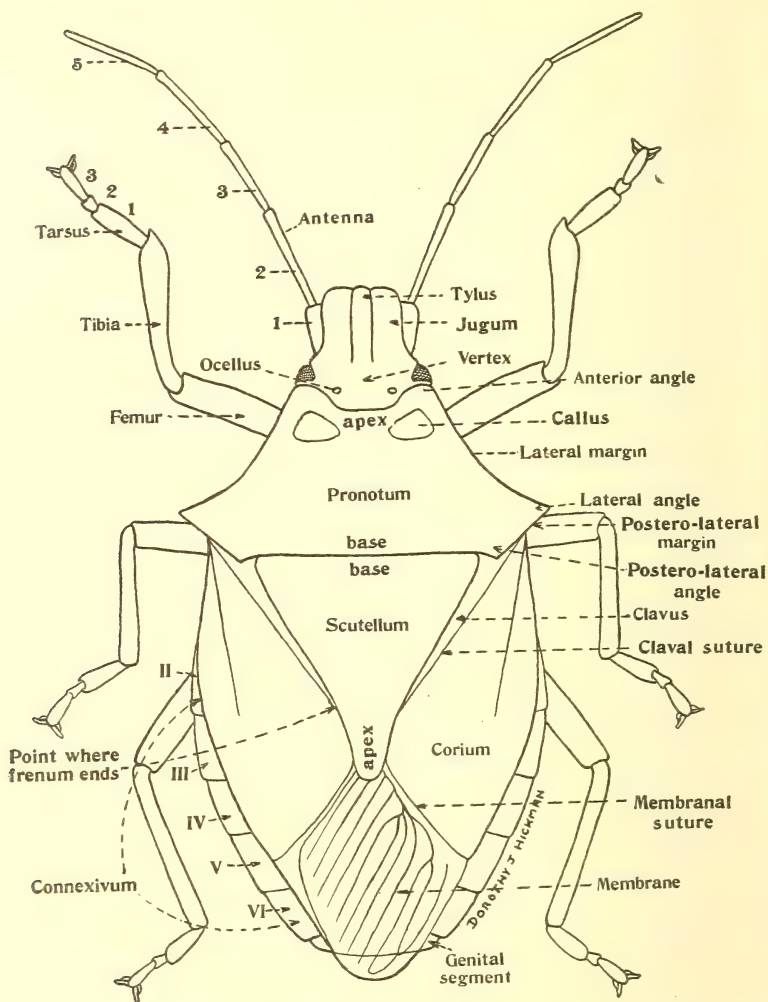


FIG. 168. *Apateticus cynicus* Say,—dorsal view showing Pentatomid structures. Greatly enlarged. Drawing by Dorothy J. Hickman.

Subfamily GRAPHOSOMATINAE.

A group of moderate extent, represented in our fauna by a single tribe and genus. The scutellum is greatly developed, being as large as in the Scutelleridae, but here it is not much wider at base than the distance between the posterior angles of the pronotum, and is usually provided with short frena.

Tribe **PODOPINI.**

Rather small insects having a tooth just in front of the lateral pronotal angles which thus appear emarginate.

Podops Laporte.

A small genus of inconspicuous species, having the anterior pronotal angles produced in an acute tooth near the eyes.

Key to Species.

- Size larger, length about 6.5 mm.; second, third, and fourth segments of antennae darker, lateral tooth of pronotum obtuse; color very dark brown **cinctipes**
 Size smaller, length 5 mm.; second, third, and fourth segments of antennae paler; lateral tooth of pronotum acute; color as in the preceding **parvula**

P. cinctipes (Say).

Am. Ent., iii, pl. 43, 1828.

A dark brown, densely punctate species occasionally taken under stones, and in beach drift.

New Haven, 20 Aug., 1909 (B. H. W.), 19 Aug., 1911 (A. B. C.); Meriden, 7 June, 1914 (H. L. J.); North Branford, 15 June, 1919 (M. P. Z.).

P. parvula Van Duzee.

Trans. Am. Ent. Soc., xxx, 22, 1904.

Very similar to the preceding, and known only from Massachusetts through Van Duzee's original record.

Subfamily **PENTATOMINAE.**

This large group comprises a great majority of the plant-feeding Pentatomidae, including most of the injurious species.

Key to Tribes.

1. Body very flat, margins explanate; head with thin dilated margin, about as wide as base of scutellum, flat above; scutellum broad, scarcely narrowed apically **Sciocorini**
 Body not extremely flat and explanate; head not very widely dilated, convex above when as wide as scutellum, usually narrower 2
2. Juga in Nearctic species with a prominent lateral tooth near apex; abdomen shallowly sulcate beneath, rostrum extending behind posterior coxae **Halyini**
 Juga without lateral tooth; abdomen not sulcate, rostrum shorter **Pentatomini**

Tribe **SCIOCORINI.**

The species of this group have a peculiar and easily recognizable facies. A single Palaearctic species is rarely found in the eastern states.

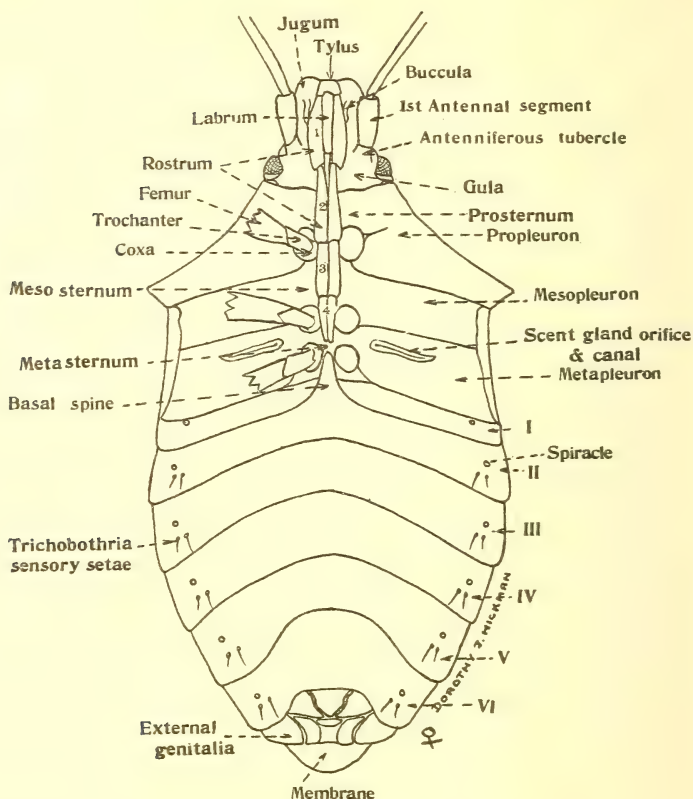


FIG. 169. *Apateticus cynicus* Say,—ventral view showing Pentatomid structures. Greatly enlarged. Drawing by Dorothy J. Hickman.

Sciocoris Fallén.

S. microphthalmus Flor.

Rhyng. Livl., i, 114, 1860.

Yellowish brown, the connexivum spotted. Form broadly oval, narrowed anteriorly. Length 5-7 mm. Occurs in Maine and New Hampshire.

Tribe HALYINI.

The species of this tribe have the head elongate; rostrum extending beyond hind coxae; the third segment much longer than the fourth, the second vertically compressed; antennae inserted at a considerable distance in front of the eyes; abdomen ventrally sulcate. A single genus, differing from all other Pentatomids in having a jugal tooth, occurs within our limits.

Brochymena Amyot and Serville.

Rather large coarsely punctate insects generally found on trees, of a distinctive type of coloration which harmonizes perfectly with the bark on which they rest. Jugal with a large lateral tooth near apex; lateral pronotal margins generally spinose or dentate; membrane with branching veins.

Key to Species.

1. Lateral angles of prothorax distinctly produced in a short truncated lobe, not rounded anteriorly **arborea**
Lateral processes less abrupt, rounded anteriorly, finely denticulate 2
2. Jugal extending much beyond apex of tylus, contiguous anteriorly, or separated and forming a long narrow apical sinus **quadripustulata**
Jugal extending but little beyond apex of tylus, more or less convergent above, forming a short sometimes transverse sinus **carolinensis**

B. arborea (Say). (Pl. xviii, 7.)

Jour. Acad. Nat. Sci. Phila., iv, 311, 1825.

Antennae and legs distinctly banded; mesosternum with a black spot. Lateral teeth of pronotum few and large; anterior tibiae not dilated. Length 14-16 mm.

New Canaan, 21 Sept., 1909 (B. H. W.), 22 Sept., 1910 (W. E. B.), 14 Sept., 1911 (B. H. W.); Wallingford, 1 June, 1910, 13 July, 1910, 6 July, 1912 (D. J. C.); Lyme, 14 May, 1911 (A. B. C.); New Haven, 5 Sept., 1911 (D. J. C.); North Branford, 8 June, 1912 (B. H. W.); Stonington, 14 May, 1914 (I. W. D.).

B. quadripustulata (Fabricius). (Pl. xviii, 6.)

Syst. Ent., 704, 1775.

Antennae concolorous; legs rather indistinctly banded; mesosternum with a black spot.

Head elongate, the jugal extending much beyond apex of tylus and often contiguous before it. Lateral teeth of pronotum very variable, but finer than in the preceding. Length 15-17 mm.

Found on or under bark of trees, sometimes in large numbers.

Westville, 16 June, 1898, 7 Sept., 1905 (W. E. B.); New Haven, 6 Sept., 6 Oct., 1902 (B. H. W.); New Canaan, 9 Oct., 1902 (B. H. W.), 19 Sept., 1910 (W. E. B.), 17 Sept., 1912 (H. B. K.); South Glastonbury, 18 Oct., 1904 (W. E. B.); Norwalk, 13 Oct., 1904 (W. E. B.); Manchester, 13 Sept., 1910 (D. J. C.); Hamden, 9 June, 1911 (W. E. B.); Middlebury, 26 May, 1911 (W. E. B.); Wallingford, 15 July, 1912 (D. J. C.); Westport, 8 Oct., 1912 (B. H. W.); Bloomfield, 2 June, 1914 (W. E. B.); Portland, 15 May, 1914 (B. H. W.), 5 June, 1914 (M. P. Z.); Farmington, 11 June, 1914 (W. M.); Scotland, 13 May, 1916 (M. P. Z.).

B. carolinensis (Westwood). (*annulata* Fabricius.)

Hope Cat., i, 22, 1837.

Base of second antennal segment narrowly pale; legs distinctly banded; mesosternum without black spot.

Head rather short, truncate anteriorly, the jugal extending very little beyond apex of tylus. Lateral teeth of pronotum small and

regular; lateral angles oblique anteriorly. Length 13-17 mm. Rare.

Rainbc , 7 May, 1914 (M. P. Z.).

Tribe PENTATOMINI.

This extensive tribe includes a large majority of our Pentatomid species. In this group the scutellum is moderate in size, head not widely explanate, jugs without lateral tooth, abdomen not sulcate at base, and the rostrum does not extend beyond the hind coxae; otherwise the species present a wide diversity in structure and facies. The members of this tribe are vegetable feeders, occasionally becoming injurious to cultivated plants, but their tastes are varied and few if any confine themselves to a single food-plant.

Key to Genera.

1. Head very convex above, triangular, almost as broad as scutellum; jugs distinctly longer than tylus; apex of corium broadly rounded
Neottiglossa, p. 765
- Head more nearly flat above, narrower; jugs often not longer than tylus; apex of corium with a distinct, but sometimes rounded, angle; if jugs are longer than tylus, or apex of corium is broadly rounded, head is not more than two-thirds width of scutellum 2
2. Base of abdomen unarmed 3
- Base of abdomen armed below with a median spine or tubercle, directed anteriorly 15
3. Lateral margins of jugs not or narrowly reflexed, not greatly thickened 4
- Lateral margins of jugs widely reflexed and greatly thickened ...
Murgantia, p. 766
4. Scutellum generally narrowed at apex, lateral margins concave; head not or slightly bent downwards 5
- Scutellum broad and rounded at apex, lateral margins almost straight; head strongly bent downwards **Cosmopepla**, p. 765
5. Metasternal orifices without sulcus or with sulcus which ends abruptly 6
- Orifices with a gradually tapering prolongation 14
6. Veins of membrane irregularly anastomosing or with numerous branches more or less distinct 7
- Veins simple or slightly branched 9
7. Scutellum narrowed at apex, shorter than the corium; apical margin straight, apical lateral angle acute 8
- Scutellum broadly rounded at apex, as long as corium; apical margin of corium rounded, apical lateral angle obtuse
Coenus, p. 764
8. Frena extending just to middle of scutellum; lateral margin of pronotum not explanate **Hymenarcys**, p. 764
- Frena extending beyond middle of scutellum; pronotal margins explanate **Menecles**, p. 765
9. Frena extending beyond middle of scutellum 10
- Frena shorter **Trichopepla**, p. 759
10. Tibiae distinctly and broadly sulcate throughout their length 11
- Tibiae not so sulcate 13
11. Lateral margins of pronotum not crenulate; lateral angles not prominent 12

- Lateral margins of pronotum crenulate, lateral angles prominent, rounded or acuminate **Euschistus**, p. 761
12. Form elongate; second and third rostral segments nearly equal .. **Rhytidolomia**, p. 760
- Form broad; second rostral segment longer than third **Chlorochroa**, p. 760
13. Lateral angles of pronotum with an anteriorly projecting spine; form elongate **Solubea**, p. 761
- Lateral angles unarmed; form broad **Mormidea**, p. 761
14. Jugal not longer than tylus **Thyanta**, p. 766
- Jugal longer than tylus, almost or quite contiguous in front **Peribalus**, p. 759
15. Jugal not or slightly longer than tylus 16
- Jugal much longer than tylus, usually contiguous in front **Dendrocoris**, p. 769
16. Fifth antennal segment less than twice length of second; metasternal orifices continued in a long tapering ruga **Acrosternum**, p. 767
- Fifth antennal segment more than twice length of second **Banasa**, p. 768

Peribalus Mulsant and Rey.

A genus of few species having the head somewhat dilated laterally, concealing the antenniferous tubercles from above, and the surface of the body without conspicuous pubescence. One species occurs within our limits.

P. limbolarius Stål. (Pl. xviii, 8.)

Enum. Hemip., ii, 34, 1872.

Brown, with close black punctation; lateral margins of pronotum and of hemielytra at base, connexival margin and apex of scutellum yellowish white. Length 7.5-9 mm. This species is often taken in sweeping vegetation. It feeds on shepherds purse and goldenrod and hibernates as adult.

New Haven, 24 June, 1902 (E. J. S. M.); East Haven, 9 July, 1908 (B. H. W.); Hamden, 24 July, 1910 (B. H. W.); Manchester, 30 Aug., 1912 (D. J. C.); Yalesville, 30 Sept., 1913 (W. E. B.); Rainbow, 24 May, 1915 (M. P. Z.); Cornwall, 12 Oct., 1919 (K. F. C.).

Trichopepla Stål.

This genus is characterized particularly by the long fine pubescence on all parts of the body. One species occurs in New England.

T. semivittata (Say).

Het. New Harm., 9, 1832.

Light to dark brown, more or less suffused and strongly punctured with black; three lines on head, lateral margins and irregular discal spot of pronotum, and margins and median line of scutellum pale and less strongly punctate. Connexivum spotted. Length 6.5-8 mm.

This peculiar form is sometimes found late in the fall in various stages of development, feeding on the wild carrot. In the newly

emerged adults the connexivum is entirely pale, the normal spotted pattern appearing later.

New Haven, 24 June, 1902 (E. J. S. M.), 12 Sept., 1904, 12 July, 1905, 17 July, 1908, 26 June, 1910, 9 July, 1911 (B. H. W.); Stony Creek, 12 Aug., 1904 (P. L. B.); Woodmont, 23 July, 1904 (P. L. B.); East Haven, 9 July, 1908 (B. H. W.); Meriden, 28 May, 1915 (H. L. J.).

Rhytidolomia Stål.

Rather large species of elongate form and olive green color, having the second and third segments of the antennae and rostrum nearly equal; juga not distinctly longer than tylus; and tibiae sulcate.

Key to Species.

Lateral margin of pronotum narrowly reflexed **senilis**
Lateral margin not reflexed **saucia**

R. saucia (Say). (Pl. xviii, 9.)

Het. New Harm., 6, 1831.

Dark olive brown, head and anterior portion of pronotum of lighter shade; median line of scutellum, lateral margin of corium, and sometimes median line of head and pronotum distinctly pale. Length 9.5-11 mm. This and the following species are occasionally met with in the salt marshes of the Atlantic coast.

Greenwich, 21 Aug., 1894 (A. P. M.); Stony Creek, 27 July, 1904 (H. L. V.); New Haven, 20 July, 1905 (B. H. W.), 19 Aug., 1912 (H. B. K.); Lyme, 3 July, 1910 (A. B. C.); East Haven, 2 May, 1912 (B. H. W.).

R. senilis (Say). (Pl. xviii, 10.)

Het. New Harm., 5, 1831.

Light to dark olive brown with more or less greenish tinge, lateral margins of corium and connexivum usually somewhat paler. Length 16-19 mm.

Branford, 20 Aug., 1905 (H. W. W.); New Haven, 2 Sept., 1910, 7 May, 1911 (A. B. C.); East Haven, 2 May, 1912 (B. H. W.).

Chlorochroa Stål.

Broadly oval species having the second segments of antennae and rostrum distinctly longer than third. One species occurs in our fauna.

C. uhleri Stål. *persimilis* Horváth. (Pl. xviii, 11.)

Enum. Hemip., ii, 33, 1872.

Bright green, lateral margins of pronotum, hemielytra at base, and connexivum pale yellow to bright red. Base of scutellum with three small pale spots, apex pale or reddish. Length 12-14 mm.

I have seen this species feeding on the cultivated nasturtium, and it is often found on other plants, especially willows and junipers.

Manchester, 4 Sept., 1913 (B. H. W.); Meriden, 1 June, 1915 (H. L. J.); Cornwall, 27 May, 1920 (K. F. C.).

Mormidea Amyot and Serville.

Rather small convex species with more or less strongly projecting eyes, frena extending beyond middle of scutellum, bucculae not reaching apex of first rostral segment, and unarmed lateral thoracic angles. A single species is found within our limits.

M. lugens (Fabricius). (Pl. xviii, 12.)

Syst. Ent., 716, 1775.

Pale brown, with coarse regular black punctation; head black; pronotum black anteriorly, the disk with a pale impunctate transverse ridge, the thickened lateral and anterior margins impunctate and pale; scutellum black, with a pale median spot at base and a pale impunctate marginal line. Base of hemielytra and connexivum narrowly pale. Length 5.5-6.5 mm.

Commonly taken in sweeping; feeds on *Verbascum*.

New Haven, 20 June, 1902 (E. J. S. M.), 26 May, 1911 (A. B. C.), 9 June, 1914 (Q. S. L.) (M. P. Z.); Mount Carmel, 24 July, 1904 (W. E. B.); Scotland, 30 July, 1904 (B. H. W.); Torrington, 7 July, 1905 (W. E. B.); Branford, 24 July, 1905 (H. W. W.), 28 July, 1905 (H. L. V.); Danbury, 15 June, 1909 (C. W. J.); West Haven, 3 June, 1910 (A. B. C.); Hamden, 28 May, 1911 (B. H. W.); Darien, 27 May, 1913 (C. W. J.); Portland, 15 Aug., 1913 (B. H. W.), 5 June, 1914 (B. H. W.); Stonington, 1 July, 1914 (I. W. D.); Milford, 12 June, 1918, Kent, 10 Aug., 1918 (M. P. Z.); North Branford, 5 July, 1921 (P. G.).

Solubea Bergroth.

This genus includes a single North American species. Form elongate; lateral angles of pronotum armed with anteriorly projecting spines; bucculae elevated in front, extending beyond apex of first rostral segment; corium more or less transparent.

S. pugnax (Fabricius).

Syst. Ent., 704, 1775.

Yellowish brown, with strong punctures, some of which are black and form marginal bands on head and pronotum. Length 8-10 mm.

This species is common to the southward and is admitted to our list on the strength of a single record of capture. It is reported to feed on grasses and allied plants.

Stamford, 13 Aug., 1891 (A. P. M.).

Euschistus Dallas.

The species of this large and exclusively American genus present a remarkably uniform appearance, being much alike in their inconspicuous brown coloration and broadly oval form. The head is elongate; lateral margins of pronotum crenulate, lateral angles

prominent, sometimes spinous, scutellum broad, narrowed toward apex.

The species are confined almost entirely to a plant diet, but they are of little economic importance as they frequent plants of little value as a general rule. Some of the species occur in great abundance in autumn on goldenrod. They have a general resemblance to the predaceous and highly beneficial species of *Podisus*, which may be distinguished by the spine at base of abdomen and the enlarged first segment of the rostrum.

Key to Species.

1. Pronotum without a raised impunctate line connecting the lateral angles 2
Pronotum with such a line *ictericus*
2. Juga not distinctly longer than tylus 3
Juga distinctly longer than tylus, but not meeting in front
euschistoides
3. Lateral angles of ventral abdominal segments with a black dot .. 4
Lateral angles usually concolorous; genital plate of male with a dark spot *variolarius*
4. Abdomen usually with a median ventral row of black spots; length usually more than 10 mm. *tristigmus*
Abdomen without ventral spots; length less than 10 mm. *politus*

E. euschistoides (Vollenhoven). (*fissilis* Uhler.) (Pl. xviii, 14.)

Versl. Med. Kow. Akad. Wetens. Amst., Ser. 2, ii, 180, 1868.

In this and the other species of the genus the color is brown, varying in each from light to dark, and sometimes tinged with red; paler on the ventral surface; punctuation dense and blackened more or less; membrane dotted with brown.

Juga acute, much longer than the tylus, forming a deep sinus at apex of head. Lateral angles of pronotum prominent, obtuse. Connexivum covered by hemielytra. Length 12-15 mm.

Taken abundantly in the fall by sweeping goldenrod, clover, etc., and known to feed on many other plants. This and other species of the genus hibernate as adults.

New Haven, 16 Aug., 1904 (P. L. B.); 12 July, 1905 (B. H. W.); Colebrook, 20 July, 1905 (W. E. B.); Rockville, 23 Aug., 1905 (H. L. V.); Scotland, 10 Aug., 1905 (B. H. W.); Greenwich, 9 July, 1907 (J. A. Cushman); New Canaan, 10 Sept., 1908 (W. E. B.); Stamford, 4 June, 1912 (H. B. K.); Litchfield, 31 May, 1913 (L. B. W.); Stonington, 22 July, 1913 (L. B. R.); 12 June, 1914 (I. W. D.); Meriden, 17 July, 1914 (H. L. J.); Farmington, 6 Sept., 1914 (W. M.); Darien, 12 June, 1915 (C. W. J.); Derby, 11 June, 1915 (M. P. Z.); Milford, 12 June, 1917 (M. P. Z.); Northford, 15 June, 1919 (K. F. C.); Stepney, 5 June, 1916 (J. S. Leonard); Wilton, 22 May, 1916 (W. E. B.); Cornwall, 23 June, 1920 (K. F. C.); Hamden, 28 May, 1920 (P. G.); Marlborough, 15 June, 1922 (W. E. B.).

E. politus Uhler.

Can. Ent., xxix, 117, 1897.

General color usually pale, irregularly speckled above and below with reddish spots; head with a black line below the margin;

pronotal punctures more blackened along lateral margins; connexivum spotted.

Juga not quite reaching apex of tylus. Lateral margins of pronotum slightly reflexed, lateral angles rounded. Connexivum narrowly exposed. Form rather depressed. Length 8-9 mm. Sometimes taken on scrub oak.

Portland, 8 Aug., 1913, 20 July, 1919 (B. H. W.).

E. tristigmus (Say).

Het. New Harm., 4, 1831.

Usually dark in shade, with black punctation; apex of scutellum pale; connexivum spotted; disc of abdomen with several prominent black spots grading larger posteriorly.

Apex of head rounded. Lateral angles of pronotum prominent, rounded or acute. Connexivum widely exposed. Length 10-12 mm.

Common and feeds on a variety of plants, including pine, goldenrod, mullein, elder, etc. The form with spinose pronotal angles is var. *pyrrhocerus* H.-S.

Torrington, 7 July, 1905 (W. E. B.); Westville, 8 and 30 July, 1905 (W. E. B.); New Canaan, 21 Sept., 1905 (W. E. B.); East Hartford, 13 Aug., 1906 (B. H. W.); Danbury, 15 June, 1909 (C. W. J.); Manchester, 30 Aug., 1912, (D. J. C.); Wallingford, 12 June, 1912 (D. J. C.); Portland, 29 May, 5 June, 1914 (B. H. W.); New Haven, 27 Aug., 1914 (W. E. B.), 16 June, 1915 (M. P. Z.); Colebrook (W. M. W.); Rainbow, 14 May, 1915 (M. P. Z.); Winsted, 14 May, 1915 (Clemens Kintz); Mystic, 25 July, 1915 (M. P. Z.); Kent, 10 Aug., 1918 (M. P. Z.); Clintonville, 24 Sept., 1917 (W. E. B.); Cornwall, 28 Nov., 1919 (K. F. C.).

E. variolarius (Palisot de Beauvois). (Pl. xviii, 13.)

Ins. Rec. Afr. Am., 149, 1805.

Pale brown, apex of scutellum usually lighter, connexivum spotted; ventral surface yellowish or greenish, the genital plate of the male with a prominent black spot.

Head rounded at apex. Pronotum broad, the lateral angles acute, often spinose. Abdomen comparatively narrow; connexivum more or less exposed. Form rather elongate, narrowed posteriorly. Length 11.5-15 mm.

Often abundant in the fall on goldenrod, and many other plants, and reported by Van Duzee to vary its vegetarian diet by attacking colonies of *Pulvinaria innumerabilis*. Like the other species of the genus it hibernates as adult.

Mount Carmel, 4 Nov., 1902 (E. J. S. M.); Yalesville, 18 Oct., 1903 (H. L. V.); New Haven, 13 Aug., 1903 (B. H. W.), 22 Aug., 1904 (P. L. B.); Oxford, 21 May, 1904 (W. E. B.); Greenwich, 4 Nov., 1904 (W. E. B.); Norwalk, 13 Oct., 1904 (W. E. B.); Scotland, 25 July, 1904 (B. H. W.); Hartford, 19 October, 1904 (W. E. B.); New Canaan, 14 and 21 Sept., 1905, 10 Sept., 1908 (W. E. B.); West Haven, 27 June, 1905 (H. L. V.); Westville, 30 July, 1905 (W. E. B.); Mystic, 25 July, 1913 (M. P. Z.); Rainbow, 7 May, 1914 (M. P. Z.); Portland, 22 May, 1914 (B. H. W.); Torrington (R. H.); Hamden, 18 June, 1915 (Q. S. L.); Wilton, 2 May, 1916 (M. P. Z.).

E. ictericus (Linnaeus).

Cent. Ins., 16, 1763.

Yellowish in shade, with irregularly arranged black punctation. Connexivum very faintly spotted. Body beneath yellowish, often distinctly greenish in the males.

Juga often slightly longer than tylus. Pronotum broad, the lateral angles very prominent, acute, connected by an elevated impunctate ridge. Abdomen narrowed posteriorly; connexivum often a little exposed. Length 10.5-12 mm.

Usually found in damp situations, where it feeds on *Carex*, *Iris*, and other marsh plants.

New Haven, 27 July, 1904 (P. L. B.), 24 Aug., 1914 (M. P. Z.); Branford, 16 Sept., 1904, 1 and 3 July, 1905 (H. W. W.); Hamden, 24 July, 1910 (B. H. W.).

Coenus Dallas.

This genus, characterized by the regularly ovate form, reticulately veined membrane, large scutellum broadly rounded at apex, and corium with apical margin arcuate and outer angle obtuse, contains a single North American species.

C. delius (Say). (Pl. xviii, 15.)

Het. New Harm., 8, 1831.

Pale yellowish brown, with moderately dense large black punctures; median line of head and lateral margins of pronotum and hemielytra impunctate. Length 7.5-9.5 mm. Commonly met with in sweeping; it usually feeds on the mullein.

Scotland, 25 July, 1904 (B. H. W.); New Haven, 6 July, 1904 (H. L. V.), 5 Sept., 1905 (B. H. W.), 18 March, 1911 (A. B. C.), 9 July, 1914 (M. P. Z.); East Haven, 16 Aug., 1906 (P. L. B.); Meriden, 10 May, 1910 (W. E. B.); Thompson, 10 May, 1910 (B. H. W.); Yalesville, 6 Oct., 1910 (D. J. C.); 18 March, 1911 (A. B. C.); Stamford, 16 Aug., 1912 (W. E. B.); Farmington, 10 Aug., 1914 (W. M.); Milford, 30 Apr., 1920 (B. H. W.); Marlborough, 15 June, 1922 (W. E. B.).

Hymenarcys Amyot and Serville.

This genus exhibits some of the peculiarities of the preceding, but the scutellum is smaller and more constricted apically, this approaching the more usual Pentatomid form, and the corium extends further posteriorly, with the lateral angle acute. One species occurs within our limits.

H. nervosa (Say).

Het. New Harm., 9, 1832.

Yellowish brown with dense black punctures, margins of pronotum and hemielytra impunctate. Length 8.5-9.5 mm.

This common southern form has been found in New England on only two occasions.

Neottiglossa Kirby.

Small species having the head equilaterally triangular in outline and almost as broad as scutellum, which is rather large, broadly rounded at apex, and as long as corium. One species occurs in New England.

N. undata (Say).

Het. New Harm., 8, 1831.

Pale brown, with black punctures gathered more densely on head, anterior portion of pronotum, and base of scutellum, and absent from tylus, median line of pronotum and scutellum, lateral margins of pronotum, and anterior angles of scutellum. Length 5 mm.

This species feeds on mullein and hibernates as adult.

North Haven, 3 Aug., 1905 (H. L. V.); Middlebury, 2 June, 1916 (M. P. Z.).

Cosmopepla Stål.

Small convex species with head strongly deflexed, narrower than scutellum, sides parallel toward apex, juga and tylus about equal; scutellum rather large, broadly rounded at apex, frena short. One of the species is found within our limits.

C. bimaculata (Thomas). (*carnifex* Fabricius.) (Pl. xviii, 18.)

Trans. Ill. St. Agr. Soc., v, 455, 1865.

Black, strongly punctate, lateral margins of pronotum, hemelytra at base, and connexivum pale or reddish; pronotum with longitudinal and transverse red impunctate vittae; scutellum with a red spot on each side near apex; membrane hyaline. Sometimes the front margins of head and thorax and edges of genital segment are also red. Length 5-6 mm.

This pretty species, well known under the preoccupied name *carnifex* Fabricius, is often taken in sweeping various plants. It feeds on buttercup, figwort, etc., and hibernates as adult.

Canaan, 19 Aug., 1894 (A. P. M.); Thompson, 11 July, 1905 (H. L. V.); Danbury, 15 June, 1909 (C. W. J.); Meriden, 3 June, 1910 (W. E. B.); Norfolk, 13 July, 1915, 5 June, 1919 (M. P. Z.); Salisbury, 13 June, 1916 (M. P. Z.); New Haven, 16 July, 1920 (M. P. Z.); Cornwall, 2 June, 1920 (K. F. C.).

Menecles Stål.

A monotypic genus characterized by the broad flattened form, rather elongate anteriorly narrowed head with juga and tylus equal, broad and laterally explanate pronotum with anterior border deeply emarginate, scutellum with long frena, and reticulately veined membrane.

M. insertus (Say). (Pl. xviii, 16.)

Het. New Harm., 6, 1831.

Pale yellowish brown, with very regular and dense black punctation; pronotum and scutellum with a narrow impunctate median line becoming obsolescent posteriorly. Length 13-14 mm.

This curious species is occasionally found resting on tree trunks, especially hickory. It has been reported as attacking the larvae of the gipsy moth.

Wallingford, 10 Aug., 1911, 20 July, 1910, New London, 2 May, 1913 (D. J. C.); Stonington, 16 June, 1914 (I. W. D.).

Thyanta Stål.

Species of moderate size having the orificial canal long and gradually tapering; tylus at least as long as juga; pronotal margins simple; the tibiae sulcate above.

Key to Species.

- Form very broadly oval; length 9 mm.**calceata**
Form more elongate; length about 11 mm.**custator**

T. custator (Fabricius).

Syst. Rhyng., 164, 1803.

Color very variable, pale green to dark olive, sometimes with a purplish band across pronotum; median line of scutellum sometimes pale; margins of pronotum and hemielytra sometimes reddish yellow. Antennae reddish brown. Ventral surface pale.

Surface densely and confluent punctate, except lateral margins of pronotum and hemielytra at base. Lateral pronotal angles prominent but not spinose. Male genital plate with slightly prominent lateral angles. Form rather elongate oval, sometimes variable. Length 9-11 mm.

This species has been taken in Massachusetts and probably occurs in Connecticut, as it is common to the southward.

T. calceata Say.

Het. New Harm., 8, 1831.

Differs from the preceding in its smaller size, shorter scutellum, constant form and coloration, the black markings on margin of head and pronotum, the purplish pronotal band, and the spots of the membrane being always present. The male genital plate is somewhat narrower, with very prominent lateral angles. Form broadly oval. Length 9 mm.

A rare species, closely related to the preceding.

New Canaan, 2 Oct., 1907 (B. H. W.).

Murgantia Stål.

A characteristically southern group of brightly colored species having the metasternal orifices inconspicuous, located near the coxae, not elevated, and without a prolonged canal, juga not longer

than tylus, frena long, and tibiae sulcate above. One species occasionally reaches our territory through commerce.

M. histrionica (Hahn).

Wanz. Ins., ii, 116, fig. 196, 1834.

Black, conspicuously ornamented with irregular and variable red or pale markings.

This is the destructive harlequin cabbage-bug, which is common throughout the southern states and has advanced northward to southern Ohio and Long Island. The species has not become established in New England; one of the two specimens so far discovered here was certainly brought in vegetables from the south, the other probably came in a similar manner.

Meriden, 7 Apr., 1910 (H. L. J.).

Acrosternum Fieber.

This genus includes large green species having the juga not, or very slightly, longer than the tylus, first antennal segment not extending beyond apex of head, fifth antennal segment less than twice as long as second, second rostral segment not shorter than the third, orifices with a long tapering canal extending more than half way to pleural margin, and, in common with the succeeding genera, a spine at base of abdomen.

Key to Species.

Lateral margins of pronotum arcuate **pennsylvanicum**
Lateral margins of pronotum straight **hilare**

A. pennsylvanicum (DeGeer).

Memoires, iii, 330, 1773.

Green, ventral margins of head, third, fourth, and fifth antennal segments in part, abdominal spiracles, and small marginal spots of connexivum, black; mesosternum dark. Length 15 mm.

This species is reported to frequent *Ceanothus* and small oak trees. Only three specimens are known to have been taken in New England.

Stonington, 30 June, 1914 (I. W. D.).

A. hilare (Say). (Pl. xviii, 17.)

Ins. of La., 9, 1832.

Clear green, marked as in the preceding, except that the pronotal and corial margins are sometimes narrowly pale. Length 15-18 mm.

One of the largest and handsomest Pentatomids of our fauna, occasionally met with in sweeping underbrush in woods, and sometimes occurring in large numbers on goldenrod.

Westville, 10 Sept., 1904, 2 March, 1915 (W. E. B.); New Canaan, 15 Sept., 1905 (B. H. W.), 16 Sept., 1915 (I. W. D.); Poquonock, 27 June, 1905 (H. L. V.); New Haven, 23 June, 1905 (B. H. W.), 7 Sept., 1910 (D. J. C.), 19 Oct., 1911 (W. E. B.), 30 July, 1911 (A. B. C.), 25 June,

1914 (W. E. B.); Lyme, 4 July, 1911 (A. B. C.) (H. B. K.); Farmington, 3 Sept., 1914 (W. M.); Meriden, 5 Sept., 1914 (H. L. J.); Sharon, 7 Oct., 1921 (W. E. B.); Middlebury, 2 June, 1916 (M. P. Z.); Southington, 2 July, 1921 (M. P. Z.).

Banasa Stål.

Species of moderate size having the fifth antennal segment more than twice as long as the second. This genus agrees with the preceding in most of its characters but is very distinct in coloration and habitus.

Key to Species.

1. Apical lateral angles of abdominal segments more obtuse, not much projecting 2
 Apical lateral angles of abdominal segments acuminate, slightly projecting; color brown **sordida**
2. Third antennal segment about twice the length of the second; head not narrowed in front **dimidiata**
 Third antennal segment shorter; head distinctly narrowed anteriorly **calva**

B. dimidiata (Say). (Pl. xviii, 19.)

Het. New Harm., 7, 1831.

Greenish, tinged with olive; head red, punctate with black; pronotum purplish posteriorly; corium purplish, lateral margins green; scutellum pale at apex.

Head broadly rounded at apex, sides of juga parallel. Lateral margins of pronotum straight, lateral angles rounded, prominent. Length 8-10 mm.

Taken frequently on cedar and reported from pine, birch, mountain ash, mullein, etc.

New Haven, 28 June, 1920 (B. H. W.); Hartford, 19 Oct., 1906, 1 Nov., 1916 (W. E. B.); Wallingford, 28 June, 1911 (J. K. L.); Portland, 8 and 14 Aug., 1913, 5 June, 1914 (B. H. W.); Stonington, May, 12 June, 1914 (I. W. D.); Farmington, 14 June, 1914 (W. M.); Union, 26 May, 1916 (M. P. Z.); Norfolk, 1917 (E. M. Stoddard); Canaan, 5 July, 1919 (M. P. Z.); Southington, 6 July, 1921 (M. P. Z.); Hamden, 6 Aug., 1922 (B. H. W.); Marlborough, 15 June, 1922 (W. E. B.).

B. calva (Say).

Het. New Harm., 7, 1832.

Similar in general to the preceding. Coloration paler; margin of abdomen with conspicuous black dots; ventral punctures of abdomen fewer and paler; sides of juga convergent anteriorly. Length 9-11 mm.

Occurs rarely in New England.

Yalesville, 19 Oct., 1903 (H. L. V.).

B. sordida (Uhler).

Proc. Bost. Soc. Nat. Hist., xiv, 98, 1871.

Brown, with green or yellow tinge, punctures darker. Lateral pronotal margins yellow, as is apex of scutellum; longitudinal line and discal spot of corium piceous; connexivum spotted. Length 10 mm.

The only specimen known to have been taken in New England is a type in the Harris collection.

Dendrocoris Bergroth.

Small, broadly ovate species having the juga longer than the tylus, and usually contiguous before it; lateral pronotal margins more or less acute, without teeth, lateral angles rounded or obtuse; femora unarmed at apex; and tibiae sulcate. A single species occurs in our fauna.

D. humeralis (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii, 400, 1877.

Pale yellowish, with dark suffusion and dense black punctation. Length 6.5-7.7 mm.

Usually taken in beating small oaks, also reported from *Carya* and white pine. Hibernates as adult.

Meriden, 10 May, 1910 (A. B. C.); Portland, 12 Aug., 1913, 22 May, 1914 (B. H. W.), 21 May, 1915 (F. W. Haasis); Stonington, 6 July, 1914 (I. W. D.); Killingly, 11 June, 1915 (W. E. B.).

Subfamily ACANTHOSOMATINAE.

In this subfamily the tarsi are two-segmented, and the frena usually extend almost to apex of scutellum. The few species representing the group in our region are rather elongate in shape and belong to the section having a large sternal keel and the abdomen carinate and armed at base with a very large spine.

Key to Genera.

Metasternal orifices with a short, broadly rounded canal **Meadorus**

Metasternal orifices with a long, gradually tapering canal

Elasmostethus

Meadorus Mulsant and Rey.

This genus, containing a single North American species, is characterized by a depression and slight amplification of the pronotal margin just behind the lateral angles, which are thus made to appear shallowly emarginate, and by the orificial structure noted in the key.

M. lateralis (Say). (Pl. xviii, 20.)

Het. New Harm., 3, 1831.

Brown, more or less tinged with red or green, coarsely punctate with black; apex of scutellum sometimes pale; connexivum spotted. Sternal ridge moderately raised, extending forward over prosternum and backward by tip of abdominal spine, which is long and acute. Abdomen with a strong obtuse percurrent carina. Length 7-9 mm. A very variably colored species, locally common.

Canterbury, 14 Aug., 1905 (B. H. W.); Lyme, 29 May, 1910, 5 Aug., 1911, 30 Apr., 1911 (A. B. C.), 4 July, 1911 (A. B. C.) (H. B. K.); Port-

land, 7, 12, 13 Aug., 1913, 15 May, 1914 (B. H. W.); Litchfield, 1 Sept., 1914 (L. B. W.); Union, 26 May, 1916 (M. P. Z.); Kent, 10 Aug., 1918 (K. F. C.); Granby, 3 Aug., 1919 (M. P. Z.); Colebrook, 19 June, 1920 (P. G.).

Elasmostethus Fieber.

This genus may be distinguished from the preceding by the simple pronotal angles and long narrow orificial canal. One species has been found in New England.

C. cruciatus (Say). (Pl. xviii, 21.)

Het. New Harm., 2, 1831.

Yellowish brown, shining, with coarse dark punctation; base of pronotum and scutellum, clavus, and inner margin of corium, and apex of abdomen, reddish. Length 10-11 mm.

Very rare in the southern parts of New England, common in the north, sometimes taken on the alder.

Eastford, 15 June, 1916 (W. E. B.).

Subfamily ASOPINAE.

The species of this group have the rostrum inserted close to apex of tylus, the first segment strongly thickened and not embedded between the bucculae, which are small and convergent posteriorly; first antennal segment in general very short; male genital plate reduced in size, not covering the copulatory apparatus. The nymphs are often of bright blue and red coloration even when the adults are of a uniform dull brown. This subfamily differs in habit from most of the other Pentatomidae, the species being carnivorous and very voracious. Their activities are very beneficial to man, as many of the species attack such injurious forms as the potato beetle and various Lepidopterous larvae such as the gipsy and brown-tail caterpillars. The nymphs in earlier stages require vegetable food, becoming exclusively carnivorous in the last instar.

Key to Genera.

1. Anterior femora armed with a spine or prominent tubercle near apex 2
 Anterior femora unarmed 3
2. Scutellum large, broad, extending almost or quite to apex of abdomen **Stiretrus**
 Scutellum moderate in size, narrowed apically **Perillus**
3. Base of abdomen without ventral spine 4
 Base of abdomen with ventral spine or tubercle 5
4. Tibiae sulcate above; lateral pronotal margins crenulate anteriorly **Rhacognathus**
 Tibiae not sulcate; pronotal margins entire **Zicrona**
5. Frena extending beyond middle of scutellum; bucculae slightly elevated, gradually decreasing in height posteriorly 6
 Frena extending to middle of scutellum; bucculae strongly elevated, not decreasing posteriorly **Mineus**
6. Tylus generally shorter than juga; male with abdominal stridulatory areas; larger species **Apateticus**
 Tylus as long as juga; areas absent; smaller species **Podisus**

Stiretrus Laporte.

Species of oval, very convex form having the scutellum large, covering most of the abdomen; frena short, not extending beyond basal third of scutellum. One species occurs in North America.

S. anchorago (Fabricius).

Spec. Ins., ii, 341, 1781.

Shining, strongly punctate; dark metallic green, head with anterior margin narrowly reddish; pronotum with large yellowish lateral patches, enclosing two or three green spots; scutellum margined with yellow except at base, median line yellow toward apex; hemielytra more or less broadly margined with yellow, membrane dark; connexivum spotted. Length 8 mm. Rare.

This species is very common in the southern states where it appears in a number of very different color varieties. The specimens taken in New England all belong to var. *fimbriatus* Say, to which the foregoing description applies. This species feeds on a variety of more or less injurious insects including the larvae of the gipsy moth.

Lyme, 27 Aug., 1911 (A. B. C.).

Perillus Stål.

Rather broad, moderately convex species, having the scutellum moderate in size, narrowed apically, the frena extending to the middle; front femora armed with a subapical spine or tooth of variable size; tibiae shallowly sulcate toward apex, the anterior not dilated. Ventral spine of abdomen short, not passing the hind coxae.

Key to Species.

- Anterior femora with a cylindrical blunt spine; color brown; length about 9 mm. **circumcinctus**
 Anterior femora with a low conical tubercle; color otherwise; length about 6 mm. **exaptus**

P. circumcinctus Stål. (Pl. xviii, 22.)

Stett. Ent. Zeit., xxiii, 89, 1862.

Brown, sometimes with reddish tinge, strongly and sparsely punctate, the punctures mostly dark; pronotum with anterior and lateral margins, and median stripe, pale yellowish, also margin and incomplete median stripe of scutellum; hemielytra and connexivum with lateral margins pale. Length 9-10 mm.

Feeds especially upon the larvae and adults of the potato beetle, but seldom if ever becomes numerous enough in this region to render any conspicuous service in this regard. The size and shape of the femoral tooth is useful in separating this species from the next, but this structure is somewhat variable in both and cannot always be depended upon.

Colebrook, 10 Aug., 1909 (W. E. Willis); Meriden, 3 May, 1914 (H. L. J.); Milford, 30 Apr., 1920 (B. H. W.); Durham, 10 Aug., 1922 (M. P. Z.).

P. exaptus (Say). (Pl. xviii, 24.)

Jour. Acad. Nat. Sci. Phila., iv, 313, 1825.

Color very variable, entirely black to pale yellowish or red with black markings, in the latter case the black often distributed as follows: head except front margin, transverse bands on disk and hind margins of pronotum, median area of scutellum, hemielytra except costal margin. Length 5-7 mm.

Several color varieties have been named but it is hardly worth while to enumerate them, as intermediate forms are more common than those that fit the descriptions.

Thompson, 13 July, 1894 (A. P. M.); New Haven, 26 Apr., 1908, 18 June, 1921 (B. H. W.); Gales Ferry, 26 Apr., 1913 (D. J. C.); Seymour, 21 Apr., 1910 (A. B. C.); Meriden, 10 July, 1914 (H. L. J.); Portland, 14 July, 1914 (M. P. Z.); Wilton, 2 May, 1916 (M. P. Z.).

Rhacognathus Fieber.

Dark, very strongly punctate species somewhat resembling *Brochymena* in general appearance; scutellum broadly rounded at tip, sides parallel in apical half; anterior tibiae unarmed, sulcate above; abdomen without basal spine; second rostral segment not shorter than the third and fourth together, third not longer than the fourth; bucculae strongly elevated; frena extending about to middle of scutellum; metasternal orifices small, canal obsolete; male without abdominal sericeous patches. This genus includes a single North American species.

R. americanus Stål.

Enum. Hemip., i, 77, 104, 1851.

Pale yellowish brown in ground color, more or less suffused with black, surface with strong, black, more or less confluent punctation, producing a general dark effect; lateral pronotal margins, median line of pronotum and scutellum, base of third antennal segment, connexival bands, and markings of legs, pale; membrane black.

Juga longer than tylus, contiguous in front. Lateral margins of pronotum straight, crenulate anteriorly; lateral angles prominent. Connexivum widely exposed. Form broadly oval. Length 9-11 mm.

This is a rare species, taken once in Massachusetts.

Mineus Stål.

This genus contains a single North American species, having the juga and tylus approximately equal; lateral pronotal margins nearly straight, obtuse, entire; scutellum rather narrowly rounded apically, the frena extending a little beyond the middle; tibiae

scarcely sulcate above, cylindrical in basal half; metasternal orifices with a slightly curved canal; abdomen with a short basal spine and sericeous patches in the male.

M. strigipes (Herrich-Schaeffer).

Wanz. Ins., ix, 338, 1853.

Bluish black, anterior and lateral margins and median line of pronotum, lateral margin of corium toward base, connexivum, and border of scutellum, red; membrane black. Length 8-9 mm.

Occasionally taken in sweeping vegetation. The markings are moderately variable in shade and extent.

New Canaan, 4 Sept., 1918 (M. P. Z.).

Apateticus Dallas.

Rather large species, having the frena extending beyond middle of scutellum; bucculae but slightly elevated, evanescent posteriorly; juga generally longer than tylus, their inner apical angles sometimes acute; orificial canal long and slightly curved forward; apical angles of sixth ventral abdominal segment rounded, not prominent; and disk of abdomen in the male with sparsely pubescent stridulatory areas.

Key to Species.

Superior lateral process of male genitalia short and flat; ventral plate of female genitalia triangular **cynicus**
Superior process long and slender; ventral plate quadrangular ... **bracteatus**

A. cynicus (Say). (Pl. xviii, 23.) (Figs. 168 and 169.)

Het. New Harm., 3, 1831.

Pale brown, with dark punctures and irregular reddish suffusion; pronotal calli more or less greenish; connexivum spotted.

Lateral margins of pronotum curved, feebly crenulate anteriorly; lateral angles acutely spinose. Ventral spine of abdomen large, extending between hind coxae.

This and the following species are very similar in most respects, but are easily distinguished by the genital characters mentioned in the table of species.

Durham, 1 Sept., 1909 (B. H. W.); New Canaan, 29 Sept., 1909 (A. I. B.), 26 Sept., 1913 (B. H. W.); Brookfield, 27 June, 1910 (E. L. D.); Portland, 15 Aug., 1913 (B. H. W.); Meriden, 13 July, 1913 (H. L. J.).

A. bracteatus (Fitch).

Third Rept., Trans. N. Y. St. Agr. Soc., xvi, 336, 1856.

Generally darker in color than the preceding, and otherwise distinguished by the less acute pronotal spines, the somewhat broader form, and the widely different genital characters mentioned in the key. Length 13-18 mm.

Sometimes taken in sweeping rank vegetation.

Litchfield, 10 Aug., 1901 (L. B. W.); Prospect, 15 Aug., 1906 (W. E. B.); Meriden, 2 Aug., 1913 (H. L. J.); New Haven, 24 Aug., 1914 (M. P. Z.); Madison, 24 Sept., 1922 (B. H. W.).

Podisus Herrich-Schaeffer.

Somewhat feebly distinguished from the preceding by the longer tylus, which equals or exceeds the juga, rather prominent and acute lateral angles of the sixth abdominal segment, absence of stridulatory areas in the male, and generally smaller size of the species. The members of this and the preceding genus hibernate in the adult condition. (For eggs, see pl. xix, 7.)

Key to Species.

1. Membrane with a dark longitudinal stripe; lateral angles of pronotum usually projecting, sometimes spinose, rarely rounded 2
 Membrane without stripe; pronotal angles rounded **placidus**
2. Basal spine of abdomen long, extending between hind coxae 3
 Basal spine short, not extending between hind coxae; lateral angles of pronotum not spinose 4
3. Lateral angles of pronotum prominent and acute, often spinose ...
 Lateral angles rounded **maculiventris**
 Lateral angles rounded **fretus**
4. Second antennal segment one-third longer than the third; lateral angles of pronotum not prominent; color grayish brown, corium with a dark spot **serieventris**
 Second antennal segment one-fourth longer than the third; pronotal angles prominent; color generally pale reddish brown ...
 **modestus**

P. fretus Olsen.

Bull. Brook. Ent. Soc., xi, 82, 1916.

Pale brown, profusely marked with red and reddish brown blotches; connexivum spotted; abdomen ventrally with lateral and median rows of reddish brown spots.

Length 12.5-14.1 mm.

Occurs in Massachusetts and southward.

P. maculiventris (Say). (Pl. xviii, 27 and 28; Pl. xx, 4.)

Ins. of La., 11, 1832.

Brown, varying irregularly in shade from light to dark, generally with a grayish, not reddish tinge; abdomen with three discal rows of small black spots, the posterior spot of the median row large. Length 10-12.5 mm.

This is the most abundant species of the genus in our territory. The present treatment of this species and *serieventris* is based on an examination of Uhler's type specimen of the latter in the Harris collection.

New Haven, 16 June, 1902 (E. J. S. M.); South Glastonbury, 18 Oct., 1904 (W. E. B.); Southington, 5 July, 1905 (B. H. W.); Cromwell, 29 Sept., 1905 (W. E. B.); Windsor, 26 July, 1905 (W. E. B.); Granby, 3 Oct., 1905; Branford, 18 July, 1908 (Mrs. A. J. Tenney); Winnipauk, 4 Aug., 1908 (C. W. J.); Portland, 14 Aug., 1913 (B. H. W.); Meriden, 6 July, 1914 (H. L. J.); Moosup, 29 July, 1914 (C. S. Miller); Pomfret, 14

June, 1916 (W. E. B.); New Canaan, 17 Sept., 1918 (B. H. W.); Greenwich, 24 June, 1922 (W. E. B.).

P. modestus (Dallas). (Pl. xviii, 26.)

List of Hemip., i, 101, 1851.

Pale reddish brown, margins of head and pronotum, and base of scutellum somewhat darker. Body beneath pale, with numerous black spots; abdomen with five rows, the spots of the median row grading larger posteriorly.

Lateral angles of pronotum prominent, rather acute, but not spinose; lateral margins angulate; Ventral spine short. Form oval, more elongate in male. Length 9-10.6 mm.

Often taken in sweeping. This form, as understood here, is very variable in size, some of the females equalling those of *maculiventris*, although the average is much smaller.

Meriden, 29 May, 1915 (H. L. J.); Woodstock, 13 May, 1915 (W. E. B.); Canaan, 5 June, 1918, Kent, 10 Aug., 1918 (M. P. Z.); Lyme, 16 June, 1918 (B. H. W.); Norfolk, 5 June, 1919, Farmington, 19 June, 1919 (M. P. Z.); New Canaan, 17 Sept., 1919 (B. H. W.).

P. placidus Uhler. (Pl. xviii, 25.)

Am. Ent., ii, 203, 1870.

Brown, with darker punctation, variably mottled and suffused with red or piceous. Lateral margins of head narrowly black. Lateral margins of pronotum pale; membrane without dark stripe; connexivum spotted. Body beneath pale, with a few small black spots, irregularly arranged anteriorly and forming two rows on each side of abdomen. Ventral spine long, extending between hind coxae. Length 9-11 mm. Taken usually in beating trees.

Stonington, 7 June, 1906 (W. E. B.), May, 1914 (I. W. D.); Brookfield, 27 July, 1910 (E. L. D.); New Haven, 22 June, 1911 (A. B. C.), 24 Aug., 1914 (M. P. Z.); Litchfield, 23 Aug., 1911 (L. B. W.); Wallingford, 1911, 25 June, 29 July, 1912 (D. J. C.); Woodbury, 14 July, 1913 (W. E. B.); Portland, 5 June, 1914 (M. P. Z.); North Stonington, 20 May, 1915 (I. W. D.); Killingly, 11 June, 1915 (W. E. B.); Rainbow, 24 May, 1915 (M. P. Z.); Lyme, 16 June, 1918 (M. P. Z.); Ansonia, 26 May, 1918 (M. P. Z.); Cornwall, 10 July, 1920 (K. F. C.); Middlebury, 9 May, 1910 (W. E. B.).

P. serieventris Uhler.

Proc. Bost. Soc. Nat. Hist., xiv, 94, 1871.

Pale brown, tinged with gray; head, anterior and lateral regions of pronotum, base and middle of scutellum, and disk of corium with prominent black markings; connexivum spotted. Body beneath pale, with darker punctures more prominent anteriorly; abdomen with five rows of black spots, the median row grading larger posteriorly.

Lateral margins of pronotum impunctate, pale, somewhat angulate at middle, irregularly crenulate anteriorly; lateral angles obtuse, slightly prominent. Ventral spine very short, not reaching hind coxae. Form oval. Length 10 mm.

This species is occasionally met with in sweeping vegetation, especially trees. The form described here agrees with Uhler's description and type, but it is not the *serieventris* of some authors. The black spot of the corium appears to be a constant feature, and, together with the rather blunt pronotal angles and short ventral spine will serve to distinguish this from the other members of the genus. In size it is often exceeded by females of *modestus*.

Branford, 18 July, 1908 (Mrs. A. J. Tenney); Woodstock, 13 May, 1915 (W. E. B.).

Zicrona Amyot and Serville.

Tylus and juga of equal length; lateral margins of pronotum entire, not carinate; scutellum rather large, broadly rounded at apex, the frena reaching to about the middle; bucculae small; femora unarmed; tibiae not sulcate above, flattened toward apex; abdomen unarmed at base, the third, fourth, and fifth segments depressed along median line; sericeous patches lacking. A single species is known.

Z. caerulea (Linnaeus).

Syst. Nat., Edn. 10, i, 445, 1758.

Iridescent greenish blue; antennae black. Length 6-7 mm.

This beautiful species has a very wide distribution, being found throughout Europe and Asia, in Japan, the Dutch East Indies, and North America. Within New England it has been met with very rarely, on the summit of Mount Washington and on the coast of Maine, but in the western states it is of common occurrence.

Adventitious specimens have been taken in Connecticut in boxes of nursery stock imported from France.

Family CYDNIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This family comprises a moderate number of species small or medium in size and usually black in color, including those with the scutellum large and convex, formerly known as Corimelaenidae, as well as some with the scutellum smaller and flat, the Cydnids proper or burrowing bugs. Many of the species are retiring in habits, living obscurely in the ground, under stones, and in decaying wood, others frequent the leaves of plants, occasionally becoming injurious, and a few are found in more or less close association with ants. The tibiae are strongly spinose; antennae generally inserted near the base of the head and distant from the lateral margin; propleura convex in front, depressed behind; abdomen with five ventral segments visible in addition to the external genitalia, the true first being hidden except for its narrow posterior margin.

Key to Subfamilies.

- Scutellum large and convex, covering the greater part of the abdomen and wings; corium usually acute at apex, not reaching apex of scutellum **THYREOCORINAE**
 Scutellum smaller, flat and triangular, not reaching broad apex of corium **CYDNINAE**

Subfamily **THYREOCORINAE.**

Small, usually black species, generally shining and sometimes inconspicuously marked with white or yellow. The large scutellum is shaped much as in the Scutelleridae and covers the hemielytra except the costal margin, which alone is strongly chitinized. The bugs belonging to this group are most often met with on plants, but are sometimes found under stones and in the excreta of mammals.

The species formerly placed in *Thyreocoris* Schrank undoubtedly form several groups of generic rank, and the forms occurring in our fauna may be placed according to the following synopsis.

Key to Genera.

- Hemielytra with a groove near the costal margin; femora with spines **Galgupha**
 Hemielytra without costal groove; femora with a few fine bristles **Corimelaena**

Galgupha Amyot and Serville.

Black species having spined femora, hind tibiae with five series of spines and a longitudinal carina, and the margins of the body without setae.

Key to Species.

- Pronotum and scutellum (as viewed from the side) together evenly convex, their bases at same level; hemielytra without a distinct ridge inside costal groove **atra**
 Pronotum and scutellum together not evenly convex, their bases meeting in a transverse groove; hemielytra with a distinct ridge inside costal groove **nitiduloides**

G. atra (Amyot and Serville). (Pl. xviii, 2.)

Hemip., 68, 1843.

Black, shining, antennae more or less reddish. Dorsal surface highly polished, with fine punctation becoming obsolete toward the middle. Form regularly oval. Length 4.8-6 mm. Often taken in sweeping vegetation.

New Haven, 16 Aug., 1904, 19 July, 1905 (B. H. W.); Guilford, 6 June, 1905 (W. E. B.); Westville, 9 Aug., 1906 (B. H. W.); Milldale, 21 May, 1906 (B. H. W.); Brookfield, 27 July, 1910 (E. L. D.); Southington, 9 June, 1910 (B. H. W.); Lyme, 14 May, 1911 (A. B. C.); Hamden, 23 May, 1919 (M. P. Z.).

G. nitiduloides (Wolff).

Icon. Cimic, iii, 98, 1802.

Black, shining; less highly polished than the preceding species, the punctures being much coarser and distributed over almost the entire surface. Form narrowed posteriorly. Length 4-5 mm.

Reported as occurring on *Ceanothus*; often found in general sweeping.

Litchfield, 7 Sept., 1901 (L. B. W.); Milldale, 21 May, 1906 (B. H. W.); Westville, 9 Aug., 1906 (B. H. W.); Salem, 10 July, 1914 (H. W. Foote); Meriden, 21 May, 1915 (H. L. J.).

Corimelaena White.

Species which are often marked with yellowish white, having the femora not spinose, hind tibiae with four series of spines and without longitudinal carina; margins of body without setae.

Key to Species.

Pale border of hemielytra not broadened at base; length more than 3.5 mm.	lateralis
Pale border broadened at base; length less than 3.5 mm.	pulicaria

C. lateralis (Fabricius).

Syst. Rhyng., 142, 1803.

Black, shining, antennae paler; costal margin of hemielytra and edge of fifth ventral segment narrowly yellowish white. Surface coarsely punctate. Form broadly oval. Length 4 mm.

This species is occasionally taken in general sweeping. It is easily distinguished by the pale, narrow costal streak.

Chapinville, 26 May, 1904 (W. E. B.); Winnipauk, 16 June, 1909 (C. W. J.); Milford, 14 June, 1918 (E. D. Brown); Hamden, 17 July, 1920 (M. P. Z.).

C. pulicaria (Germar).

Zeit. f. Ent., i, 39, 1839.

Black, shining, antennae brown; exposed portion of hemielytra broadly pale, except for some black punctures; edges of fourth and fifth and posterior margin of terminal dorsal abdominal segments reddish yellow. Surface punctured. Form rather broadly oval. Length 2.7-3.2 mm.

The smallest and commonest species of the group. It is found in sweeping various plants, and frequents the flowers and fruit of strawberry, blackberry and raspberry to which it imparts an unpleasant taste.

Litchfield, 3 Aug., 1901 (L. B. W.); Branford, 18 and 28 July, 1905 (H. L. V.); Stafford, 24 Aug., 1905, Westville, 3 Aug., 1905 (W. E. B.); New Haven, 20 July, 1904 (W. E. B.), 19 July, 1905, 17 May, 1906, 20 July, 1908 (B. H. W.); Brookfield, 27 July, 1910 (E. L. D.); Hamden, 28 May, 1920 (P. G.).

Subfamily CYDNINAE.

Species of moderate or small size, with scutellum flat, triangular, much smaller than in the group preceding, and not extending to apex of corium; the latter broad at tip, and entirely exposed.

Key to Tribes.

Front tibiae broad and flat	Cydnini
Front tibiae cylindrical, dilated apically	Sehirini

Tribe **CYDNINI.**

Species of black or rarely brown color living for the most part in the ground, under stones and in ant nests. The tibiae are thickly set with strong spines and long setae, inserted irregularly over the entire surface except on the front legs where the tibiae are flattened and the spines confined largely to the anterior edge and broad apex of the segment. These structures, and the entire ventral aspect of the insects in a general way, recall very strongly the corresponding parts as developed in the Histerid beetles, the apparent convergence extending even to the mode of attachment of the spines, which, in the Cydnines, are not continuous with the tibial surface but are set into cup-like elevations, after the manner of the "inserted denticles" of the beetles. This similarity in structure may perhaps have arisen in connection with the similarity in habits of many of the species, which in both groups are more or less subterranean and myrmecophilous. But our knowledge of these most mysterious Hemiptera is very incomplete and further observations on their modes of life will be of the greatest interest. The species of this tribe are characteristically southern in distribution and they are rarely to be met with in New England.

Key to Genera.

1. Margin of head toothed; color brown **Amnestus**
 Margin of head entire; color black 2
2. Pronotum with an impressed line along anterior margin **Pangaeus**
 Pronotum without impressed line **Geotomus**

Pangaeus Stål.

Head almost flat, anterior margins broadly rounded, narrowly reflexed; metasternal orifices with a narrow somewhat irregular canal. Anterior tibiae broadly flattened. Form oval, the margins ciliate with strong sparse setae. One species is reported from our territory.

P. bilineatus (Say).

Jour. Acad. Nat. Sci. Phila., 10, 1832.

Black, shining, antennae and rostrum paler. Length 6.5-7.5 mm.

Known to occur in New England only from Massachusetts and Connecticut records given by Uhler.

Geotomus Mulsant and Rey.

Head broadly rounded anteriorly, margins ciliate and narrowly reflexed; orificial canal broadly rounded at apex. Anterior tibiae moderately flattened. Form oval, margins ciliate.

G. robustus (Uhler).

Bull. U. S. Geol. Geog. Surv. Terr., iii, 390, 1877.

Black, shining; antennae, rostrum, and legs dark reddish brown; corium sometimes reddish; membrane white, slightly tinged with brown. Length 3.7 mm.

Known from New England only by Uhler's Massachusetts record.

Amnestus Dallas.

Small, convex, brownish species having margin of head toothed; metasternal orifices with long and scarcely curved canal. Scutellum triangular, almost equilateral, sides nearly straight. Corium broad, posterior margin sinuate; clavi contiguous behind scutellum. The male genital segment is triangular with a tubercle at middle; the female ring-like, enclosing the smaller plates.

Key to Species.

1. Length 4 mm.; color dark; form strongly convex **spinifrons**
Length less than 3 mm.; usually paler; less strongly convex 2
2. Juga with four teeth; disk of pronotum strongly punctate anteriorly **pusillus**
Juga with five teeth; disk of pronotum obsoletely or sparsely punctate anteriorly **pallidus**

A. spinifrons (Say). (Pl. xviii, 3.)

Jour. Acad. Nat. Sci. Phila., iv, 316, 1825.

Shining chestnut brown, corium a little paler; membrane translucent white; antennae, rostrum, and legs reddish brown. Anterior femora in female armed with a large bifid spine. Length 4 mm.

A rather rare species, sometimes found under stones in spring, after hibernation in the adult condition.

West Haven, 11 May, 1905 (B. H. W.); Yalesville, 26 May, 1908 (B. H. W.); Southington, 27 Apr., 1910 (W. E. B.); Orange, 21 May, 1911 (B. H. W.); Meriden, 1 May, 1914 (H. L. J.).

A. pusillus Uhler.

Bull. U. S. Geol. Geog. Surv. Terr., i, 278, 1876.

Reddish to pale brown, shining, corium lighter in color, membrane white. Anterior femora of the female without bifid spine. Length 2.25-2.75 mm.

This species, occurring in Maine, has been confused with the following.

A. pallidus Zimmer.

Can. Ent., xlii, 166, 1910.

Similar to the preceding but somewhat larger and having much finer and less regular punctation, the disk of the pronotum being almost impunctate before and behind the coarsely punctate transverse impression. Anterior femora in the female armed ventrally with a large bifid spine. Length 2.75 mm.

Occasionally found under stones and by sifting.

New Haven, 15 May, 1905, 24 May, 1921 (B. H. W.); Orange, 25 May, 1920 (B. H. W.).

Tribe SEHIRINI.

In the species of this tribe the head is destitute of marginal teeth or setae and the anterior tibiae are cylindrical toward base, becoming dilated and triangularly prismatic at apex. There is but one known North American species.

Sehirus Amyot and Serville.

Species of moderate size, having the juga extending slightly beyond apex of tylus; mesosternum with a fine median carina; scutellum elongate, the sides nearly straight; apical margin of corium oblique, nearly straight; anterior femora unarmed; and the orificial canal broad and flat.

S. cinctus (Palisot de Beauvois). (Pl. xviii, 4.)

Ins. Rec. Afr. Am., 114, 1805.

Bluish black, lateral margin of corium and more or less of the connexival margin, outer face of tibiae, and usually a small spot at apex of corium white and impunctate; second antennal segment reddish; membrane brownish hyaline. Body beneath, black. Form oval, broadened posteriorly. Length 5.7 mm.

Often taken in general sweeping and reported to feed on the wild raspberry. Hibernates as adult and is one of the first Hemiptera to become active in the spring.

New Haven, 20 July, 1908, 9 July, 1911 (B. H. W.), 16 July, 1920 (M. P. Z.); Brookfield, 27 July, 1910 (E. L. D.); New Canaan, 30 Apr., 1919 (M. P. Z.); Cornwall, 11 July, 1920 (K. F. C.).

Family SCUTELLERIDAE.

By HOWARD MADISON PARSHLEY, Sc.D.

This extensive family is represented within our limits by but two species, neither of which exhibit the brilliancy of lustre and ornamentation often characteristic of the forms inhabiting the warmer regions of the world. The more important characters of the group are as follows: hind wings with primary and subtended veins separated by a considerable area which is broadest at middle, provided with a hamus; body convex, generally both above and below; scutellum without frena, very large and convex, covering almost all of the abdomen and leaving exposed only the costal edge of the corium when the wings are at rest; tibiae without spines; mesosternum longitudinally sulcate; abdomen with six visible ventral segments besides the external genitalia, which in the male consist of a single genital plate, in the female of several smaller plates accurately fitted together; ocelli present; rostrum four-

segmented; tarsi three-segmented; probably always phytophagous, but their habits and life histories are little known.

Key to Subfamilies.

Ventral aspect of abdomen with a finely striated stridulatory area on each side near the median line in both sexes; connexivum not prominently exposed in our species TETIRINAE
 Abdomen without stridulatory areas; connexivum prominently exposed in our species ODONTOTARSINAE

Subfamily TETIRINAE.

Most of the species of this group are very convex in form and many are of velvety appearance with frequently very variable markings. A single genus and species occurs in our fauna.

Homaemus Dallas.

In this genus the species have the scutellum covering hemielytra except at base; connexivum narrowly exposed except at apex of abdomen; orifices situated near the coxae, extended in a long groove with narrow parallel raised margins, curved forward laterally; and the tibiae sulcate above.

H. aeneifrons (Say). (Pl. xviii, 1.)

Longs Exp. to St. Peters River, ii, 299, 1824.

Velvety brown, very variable in shade, with indefinite darker markings on pronotum and scutellum which become scarcely appreciable in the darker specimens; head black with violaceous iridescence; connexivum spotted. Dorsal surface closely punctured; head with decumbent pale pubescence. Length 6.5-9 mm.

I have taken this species in large numbers in late fall in the White Mountains by sweeping *Solidago*. It is very rare in the lowlands, but extends far to the south in mountainous regions.

Thompson, 11 July, 1905 (H. L. V.); Scotland, 30 July, 1904, 10 Aug., 1905 (B. H. W.); Litchfield, 16 Sept., 1908 (L. B. W.); Colebrook, 1 Sept., 1911 (W. M. Wheeler).

Subfamily ODONTOTARSINAE.

In this group the abdomen is destitute of stridulatory areas, and many of the species are less convex than in the preceding, although generally equally rounded above and below. Of the few North American forms, one is found within our limits.

Eurygaster Laporte.

The species of this genus have the connexivum and costal margin of hemielytra exposed; orifices distant from the coxae, prolonged in a short straight groove, and the tibiae sulcate above.

E. alternata (Say). (Pl. xviii, 5.)

Am. Ent., iii, pl. 43, 1828.

Light to dark brown, variably marked, the median line with a more or less prominent pale streak widening posteriorly, two short vittae at base of scutellum and margin of corium more or less pale; dorsal punctures more or less blackened; connexivum spotted; tibiae minutely spinulose. Length 7-10 mm.

Taken by sweeping *Carex* and other plants, generally in swampy places.

Thompson, 3 Aug., 1892 (A. P. M.); New Haven, 18 June, 1902 (E. J. S. M.), 8 June, 1904 (W. E. B.), 4 Aug., 1904 (H. L. V.), 9 June, 1905, 17 July, 1908, 18 June, 1911 (B. H. W.); Scotland, 25 July, 1904. Portland, 15 Aug., 1913 (B. H. W.); Litchfield, 31 May, 1913 (L. B. W.); Meriden, 19 June, 1914 (H. L. J.); Cornwall, 9 June, 1920 (K. F. C.).

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 (Notonecta), 404, 405.
 (Oncopsis), 70.
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 variata, 143.

- variegata (Eiptera), 29, 30.
 (Physatocheila), 705.
variolarius, 762, 763.
variolosum, 349.
varus, 118, 120.
vastatrix, 331.
vau, 193, 196.
veaziei, 245.
Velia, 416, 417.
Veliidae, 383, 416.
venaefuscae, 305.
venafuscus, 322, 323.
venaticus, 598, 604.
venatorius, 481, 483.
ventralis, 684, 685.
ventricosus, 22.
venusta, 246, 247.
venustus (Phytocoris), 645, 651.
 (Polymerus), 598, 605.
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vernalis, 244.
vernoniae, 297.
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verticis, 62, 66.
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 (Lygus), 581, 585.
viburnicola, 291, 297.
viburniphila, 291, 297.
vicarius (Emblethis), 733.
 (Oeciacus), 670.
vicina, 693.
vicinum, 549.
vicinus, 525, 529.
viminalis, 283.
vinnulus, 105, 110.
violae, 302, 304.
virescens var. graminea, 67.
viridescens, 152, 154.
viridicans, 597.
viridis (Macropsis), 67, 68.
 (Orthotylus), 512, 519.
 (Parabolocratus), 93.
 (Xerophloea), 84.
viridius, 139, 140.
vitellina, 94.
vitifoliae, 330, 331.
vitis, 355, 356.
vitripennis, 478.
vittatus, 617, 627.
vitticollis, 582, 589.
vittipennis, 51.
vittiscutis, 562, 566.
vituli, 20.
vulgaris, 40.
vulnerata (Erythroneura), 160, 162.
 var. nigra, 160, 163.
 (Spangbergiella), 93.
waldeni (Kermes), 350, 351.
 (Liburnia), 29.
 (Psallus), 463, 468.
 (Trialeurodes), 340, 343.
walshi, 538.
Water-striders, 658.
weedi, 105, 109.
westwoodi, 42.
wolfii, 43, 44.
xanthocephala, 231, 235.
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xanthochila, 412, 414.
Xantholobus, 172, 201.
Xenoborus, 560, 567.
Xerophloea, 80, 84.
Xestocephalus, 85, 87.
Xestocoris, 734, 736.
Xylocoris, 666.
xylostei (Prociphilus), 322, 323.
 (Siphocoryne), 299, 301.
yuccae, 297.
zamia, 366, 368.
Zelinae, 677, 685.
Zelus, 685, 687.
Zeridoneus, 723, 727.
Zicrona, 770, 776.
zizyphi, 380, 381.

PLATE I. PARASITICA.

1. *Pediculus capitis* DeGeer,—head louse of man, x 16.
2. *Pediculus corporis* DeGeer,—cootie, or body louse of man, x.
12.
3. *Linognathus piliferus* Burmeister,—dog louse, x 21. 3.
4. *Linognathus vituli* Linnaeus,—long-nosed ox louse, x 18. 4.
5. *Linognathus vituli* Linnaeus,—eggs, x 11. 3.
6. *Haematopinus eurysternus* Nitzsch,—short-nosed ox louse, x.
14.
7. *Haematopinus suis* Linnaeus,—hog louse, x 9. 2.
8. *Phthirius pubis* Linnaeus,—crab louse of man, x 16. 7.

Photographs, 8 by H. A. Doty ; others by B. H. Walden.

PLATE I.

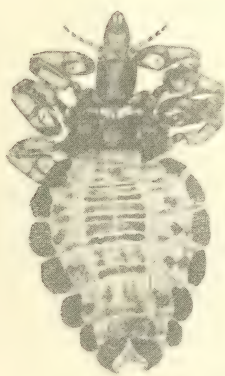
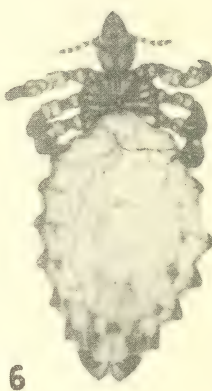
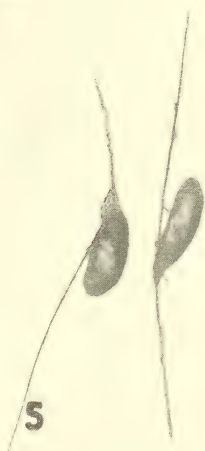
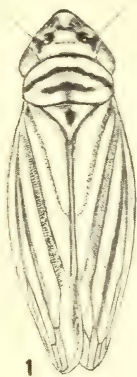


PLATE II.



S⁺D^cL

PLATE II. CICADELLIDAE.

1. *Kolla tripunctata* Fitch.
2. *Kolla bifida* Say.
3. *Platymetopius acutus* Say.
4. *Eutettix cinctus* Osborn and Ball.
5. *Eutettix seminudus* Say.
6. *Phlepsius fulvidorsum* Fitch.
7. *Scaphoideus lobatus* Van Duzee.
8. *Phlepsius atropunctatus* DeLong.
9. *Thamnotettix collaris* Ball.

All greatly enlarged. Photographs by J. G. Sanders and
D. M. DeLong.

PLATE III. CICADELLIDAE.

1. *Deltocephalus areolatus* Ball.
2. *Deltocephalus sayi* Fitch.
3. *Deltocephalus obtectus* Osborn and Ball.
4. *Deltocephalus configuratus* Uhler.
5. *Deltocephalus striatus* Linnaeus.
6. *Deltocephalus sylvestris* Osborn and Ball.
7. *Scaphoideus sanctus* Say.
8. *Mesamia nigradorsum* Ball.
9. *Euscelis curtisii* Fitch.

All greatly enlarged. Photographs by J. G. Sanders and
D. M. DeLong.

PLATE III.

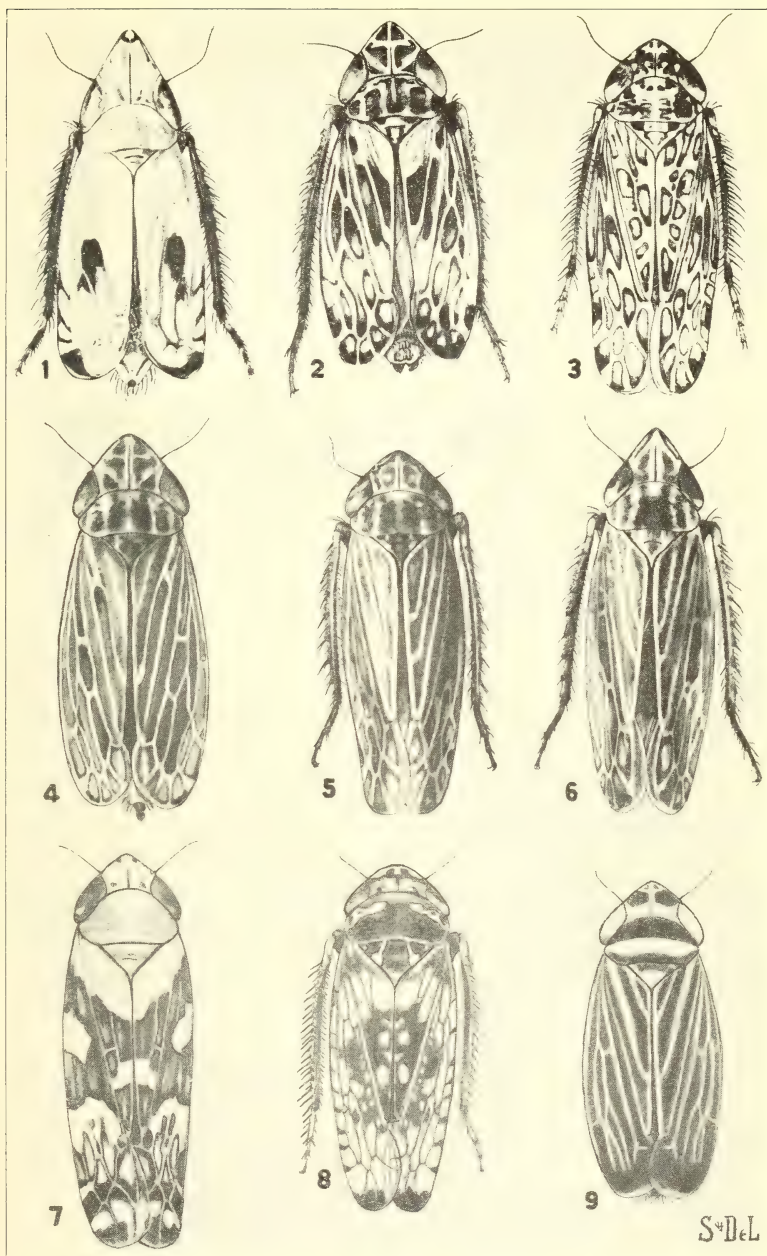


PLATE IV.

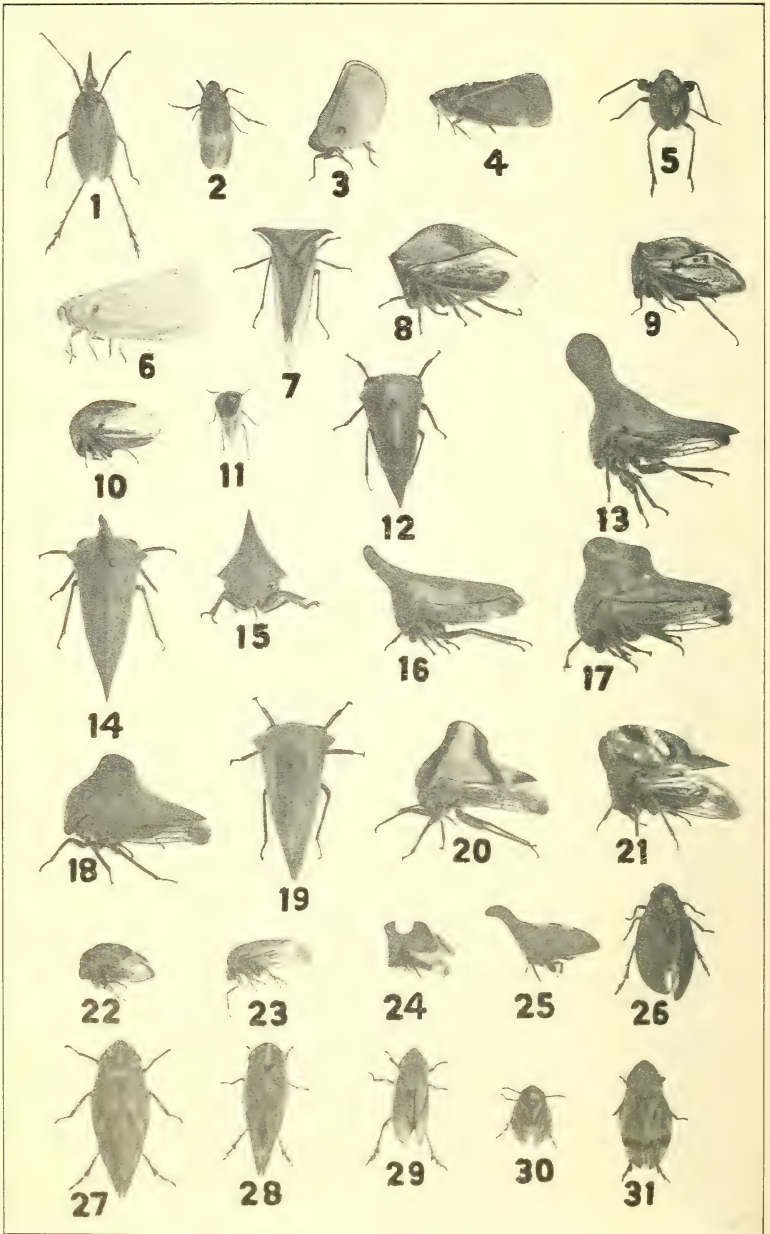


PLATE IV. FULGORIDAE, MEMBRACIDAE, CERCOPIDAE.

1. *Scolops sulcipes* Say.
2. *Oliarus humilis* Say.
3. *Acanalonia bivittata* Say.
4. *Ormenis pruinosa* Say.
5. *Phylloscelis atra* Germar.
6. *Ormenis septentrionalis* Spinola.
7. *Ceresa taurina* Fitch.
8. *Ceresa bubalus* Fabricius.
9. *Ceresa diceros* Say.
10. *Stictocephala lutea* Walker.
11. *Microtalis calva* Say.
12. *Carynota mera* Say.
13. *Glossonotus acuminatus* Fabricius.
14. *Thelia bimaculata* Fabricius,—female.
15. *Thelia bimaculata* Fabricius,—male, front.
16. *Thelia bimaculata* Fabricius,—male, lateral view.
17. *Telamona maculata* Van Duzee.
18. *Telamona querci* Fitch.
19. *Telamona unicolor* Fitch,—female.
20. *Telamona unicolor* Fitch,—male.
21. *Smilia camelus* Fabricius.
22. *Cyrtolobus van* Say.
23. *Atymna castaneae* Fitch.
24. *Entylia carinata* Förster (*bactriana* Germar).
25. *Enchenopa binotata* Say.
26. *Monecphora bicincta* var. *ignipecta* Fitch.
27. *Aphrophora parallela* Say.
28. *Aphrophora saratogensis* Fitch.
29. *Philaenus lineatus* Linnaeus.
30. *Clastoptera proteus* Fitch.
31. *Lepyronia quadrangularis* Say.

All twice natural size. Photographs by B. H. Walden.

PLATE V. CICADIDAE.

1. *Tibicina septendecim* Linnaeus,—periodical cicada or seventeen year locust, adult and pupa skin.
2. *Tibicina septendecim* Linnaeus.
3. *Tibicen lyricen* DeGeer.
4. *Tibicen linnei* Smith and Grossbeck.
5. *Tibicen canicularis* Harris.
6. *Tibicen chloromera* Walker,—male, underside.
7. *Tibicen auletes* Germar,—pupa skin.
8. *Tibicen auletes* Germar.

All natural size. Photographs by B. H. Walden.

PLATE V.

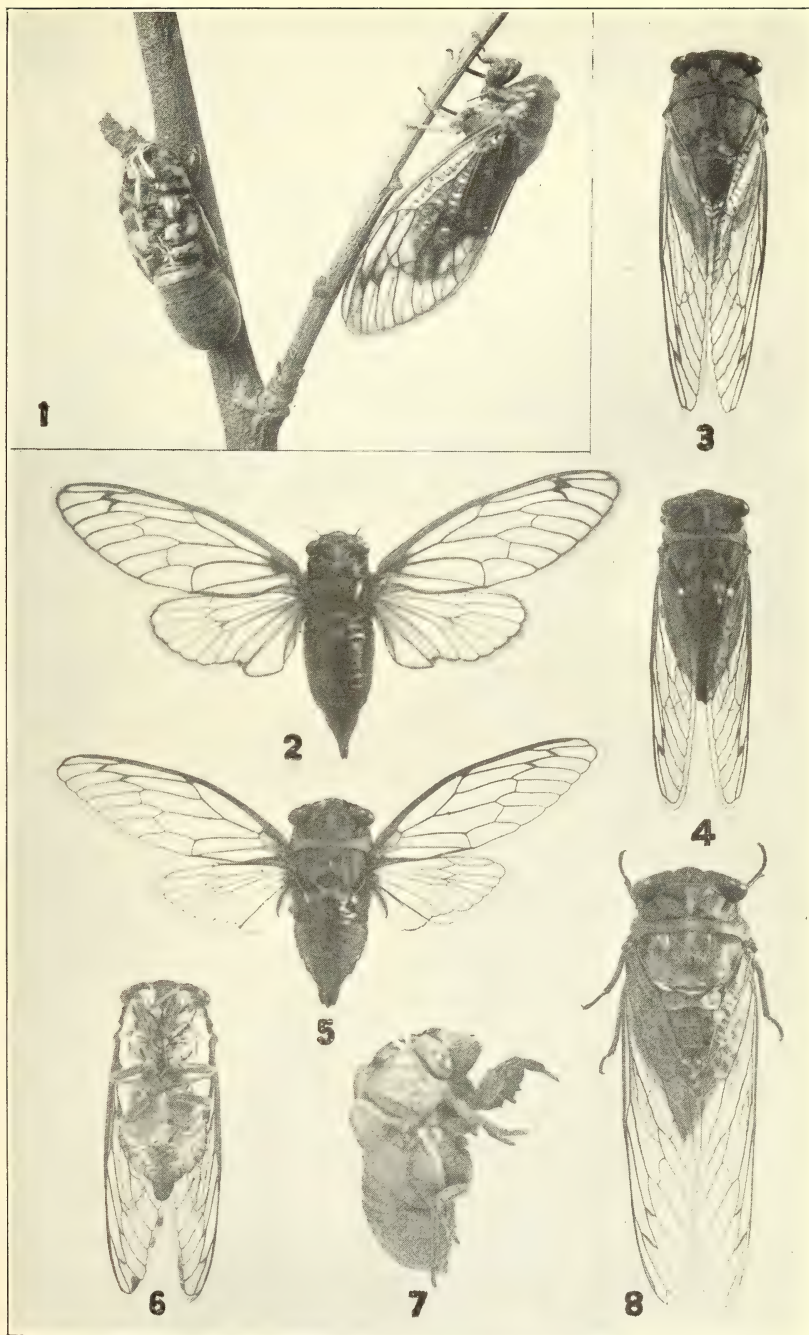


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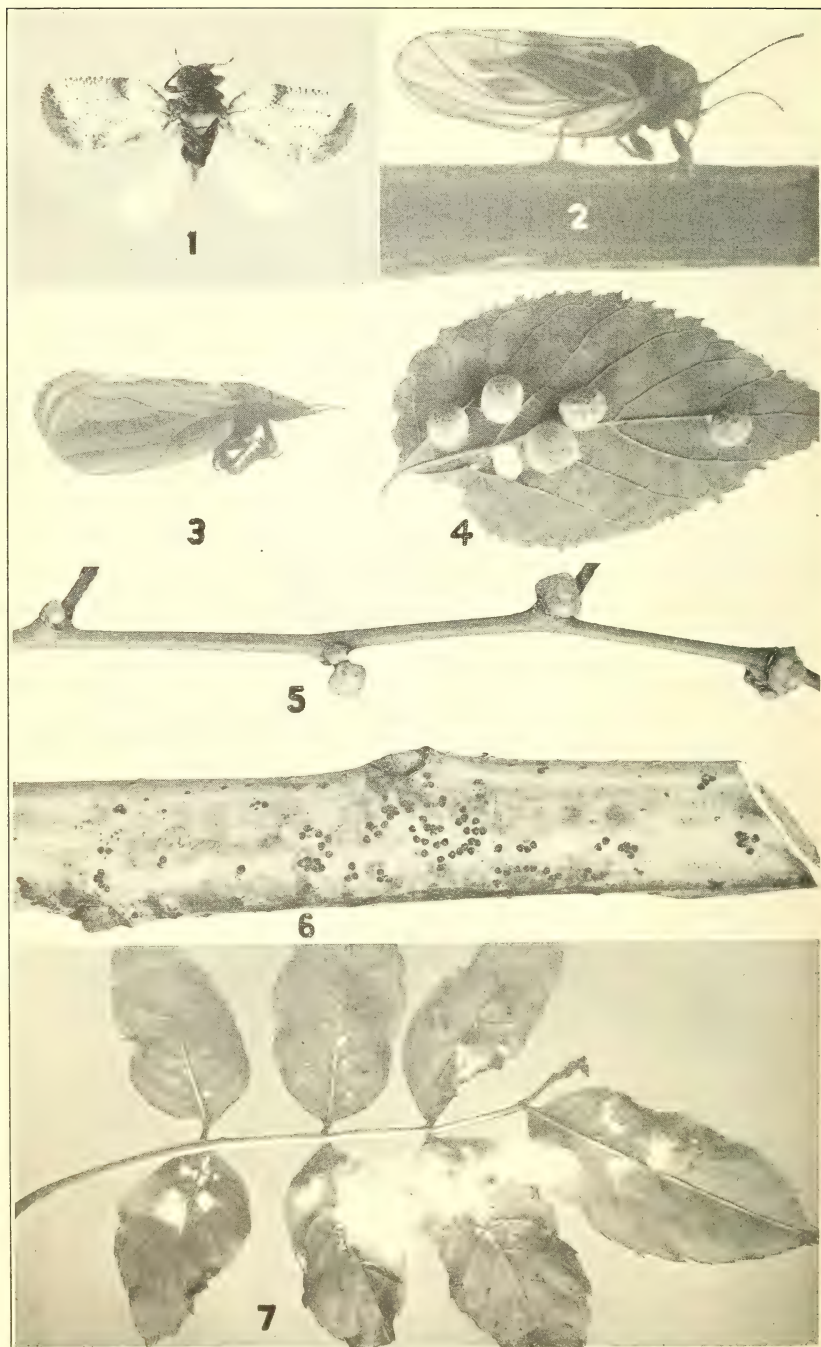


PLATE VI. PSYLLIDAE.

1. *Livia maculipennis* Fitch, x 12.
2. *Psylla pyricola* Foerster,—pear psylla, x 12.
3. *Livia vernalis* Fitch, x 12.
4. *Pachypsylla celtidis-mamma* Riley,—galls on hackberry leaf,
x 1.
5. *Pachypsylla celtidis-gemma* Riley,—galls on hackberry twig,
x 1.
6. *Calophya flavida* Schwarz,—pupae on stem of *Rhus glabra*,
x 1.
7. *Psyllopsiis fraxinicola* Foerster, x 1.

Photographs 6 and 7 by W. E. Britton; others by B. H. Walden.

PLATE VII. APHIDIDAE.

1. *Longistigma (Lachnus) caryae* Harris,—apterous form, x 1.
2. *Aphis pomi* DeGeer,—green apple aphid, x 2.
3. *Aphis pseudobrassicae* Davis,—turnip aphid, x 1.
4. *Anuraphis tulipae* Boyer, x 1.
5. *Brevicoryne brassicae* Linnaeus,—cabbage aphid, x 1.
6. *Amphorophora rhois* Monell, x 1.

Photographs by B. H. Walden.

PLATE VII.

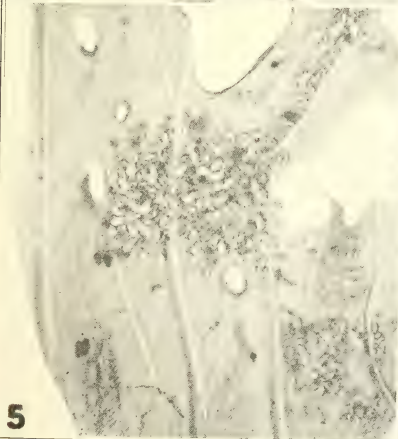
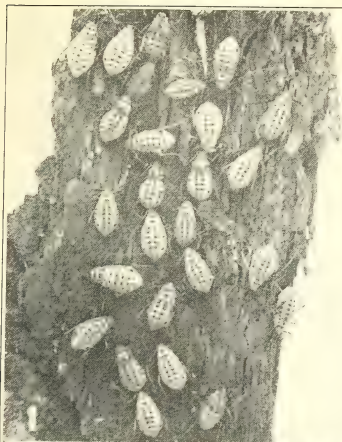


PLATE VIII.

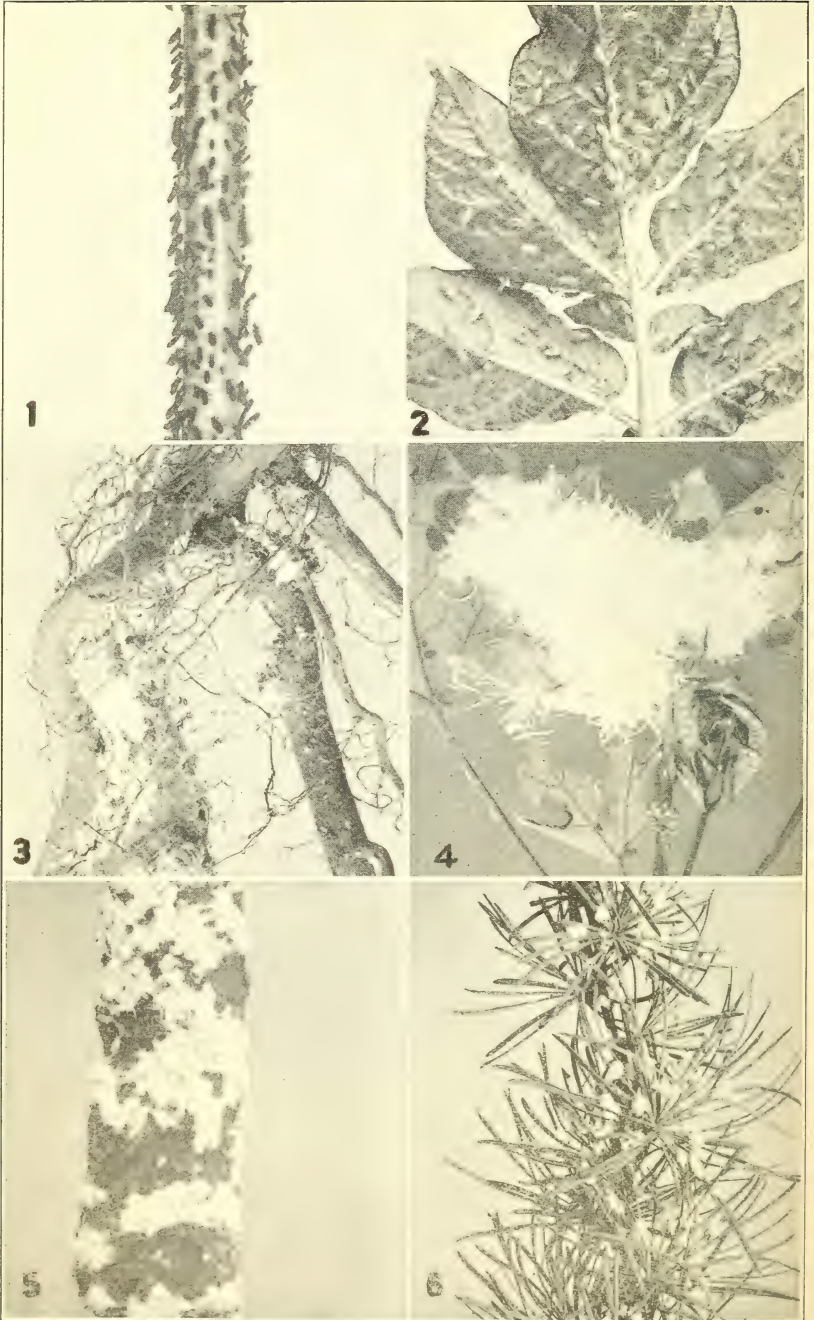


PLATE VIII. APHIDIDAE.

1. *Macrosiphum rudbeckiae* Fitch, x 1.
2. *Macrosiphum solanifolii* Ashmead,—potato aphid, x 1.
3. *Eriosoma lanigerum* Hausman,—woolly apple aphid, x 1.
4. *Prociphilus tessellata* Fitch, x 1.
5. *Chermes pinicorticis* Fitch,—pine bark aphid, x 1.
6. *Chermes strobilobius* Kaltenbach,—woolly larch aphid, x 1.

Photographs by B. H. Walden.

PLATE IX. APHIDIDAE.

1. *Saltusaphis americanus* Baker.
2. *Thripsaphis balli* Gillette.
3. *Saltusaphis elongatus* Baker.
4. *Saltusaphis flabellus* Sanborn.
5. *Saltusaphis scirpus* Theobald.
6. *Saltusaphis virginicus* Baker.

All greatly enlarged. (From Canadian Entomologist.)

Photographs by Dr. A. C. Baker.

PLATE IX.

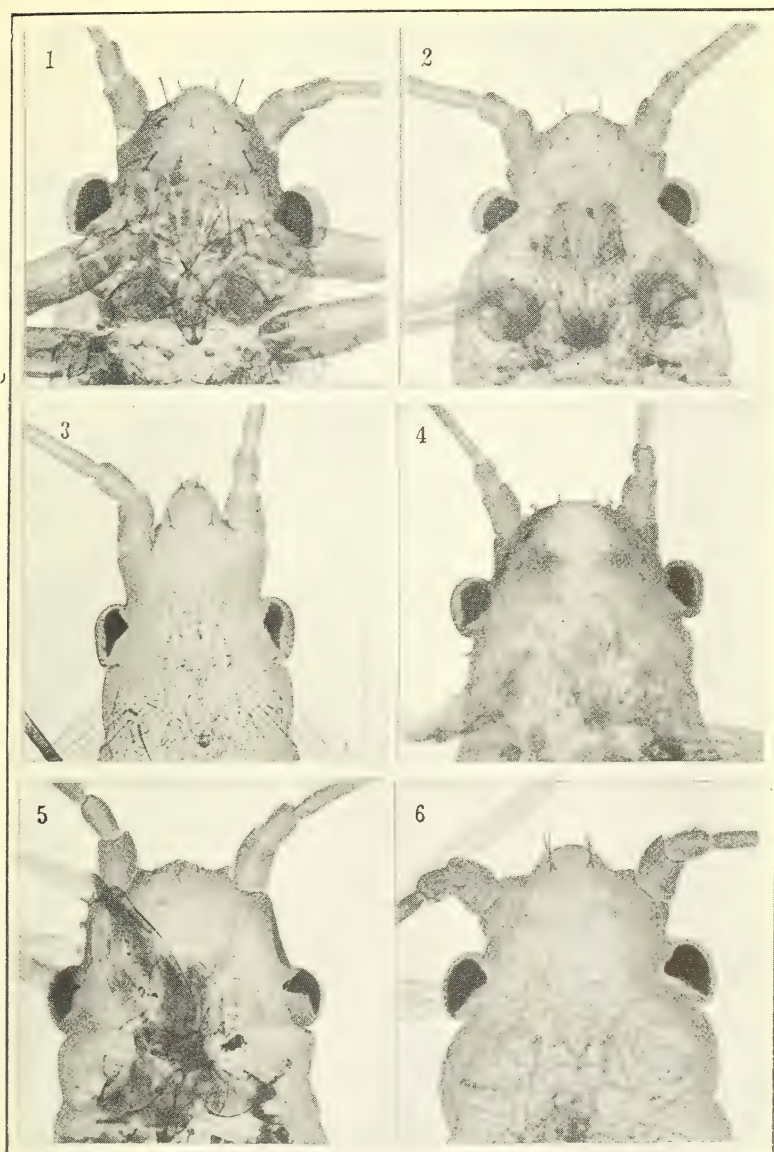
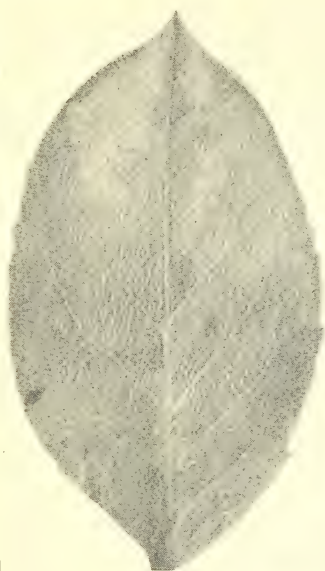
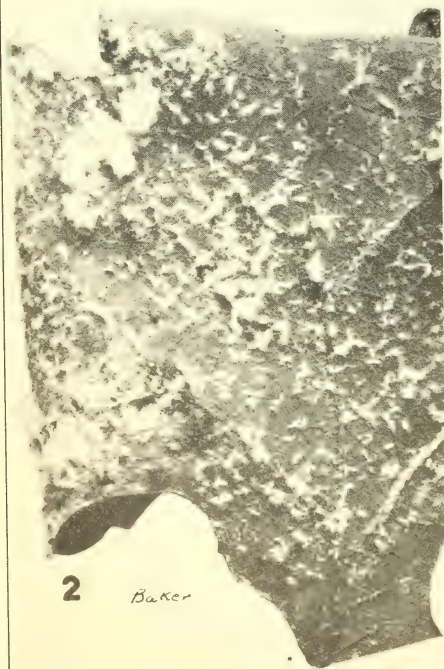


PLATE X.



1



2

Baker



3

PLATE X. APHIDIDAE.

1. *Tamelia coweni* Cockerell,—blackberry gall aphid, showing galls formed on the leaves of bearberry. Normal leaf at left.
2. *Tamelia quercifoliae* Gillette,—woolly oak aphid, showing appearance on oak leaf.
3. *Phyllaphis fagi* Linnaeus,—woolly beech aphid, showing colonies on leaf of copper beech.

All natural size. Photographed by Dr. A. C. Baker.

PLATE XI. APHID GALLS.

1. *Mordwilkoja vagabundus* Walsh,—vagabond poplar gall, x 1.
2. *Pemphigus populicaulis* Fitch, x 1.
3. *Hamamelistes spinosus* Shimer, x 1.
4. *Hormaphis hamamelidis* Fitch, x 1.
5. *Phylloxera caryaecaulis* Fitch,—hickory aphid gall, x 1.
6. *Chermes cooleyi* Gillette, x 1.
7. *Chermes abietis* Linnaeus,—spruce aphid gall, x 1.

Photographs by B. H. Walden.

PLATE XI.

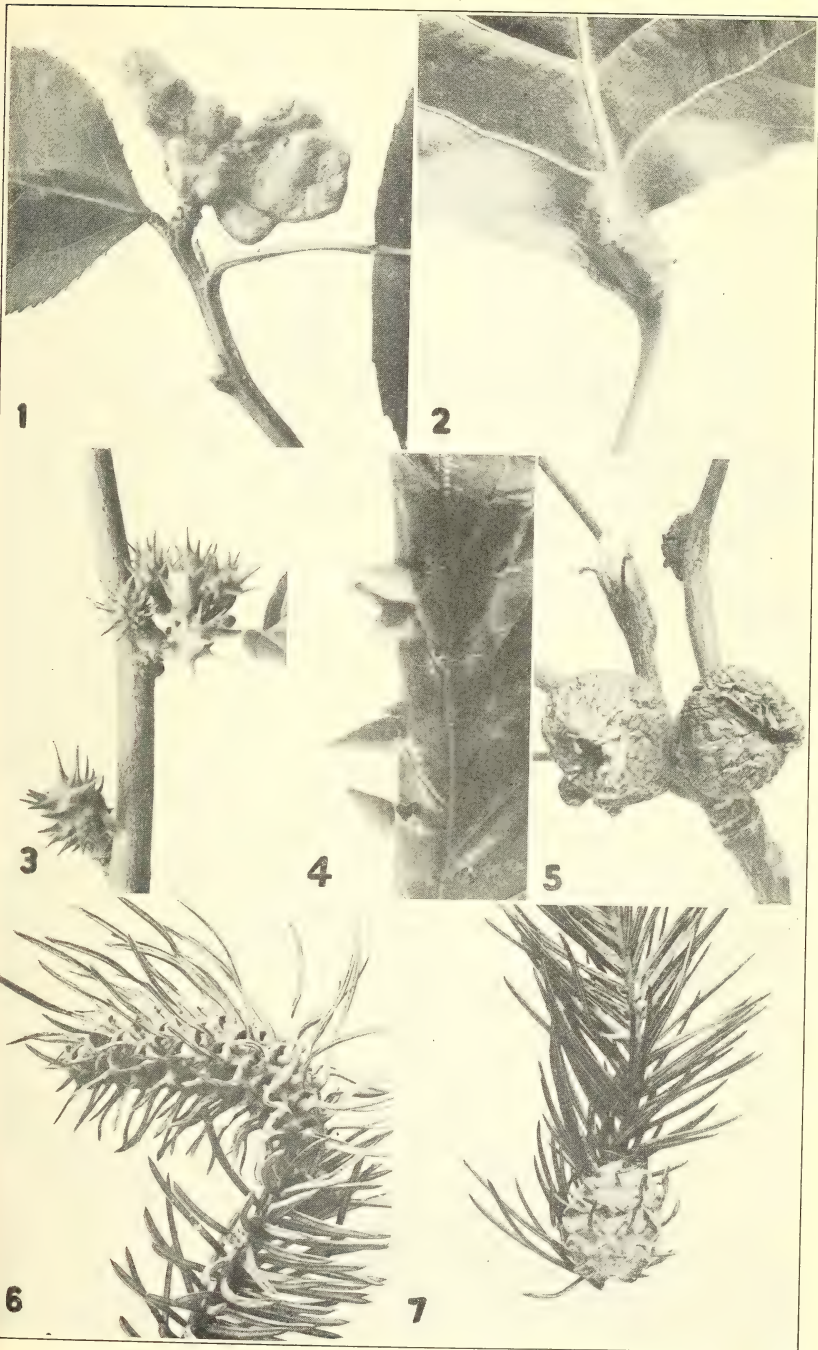


PLATE XII.

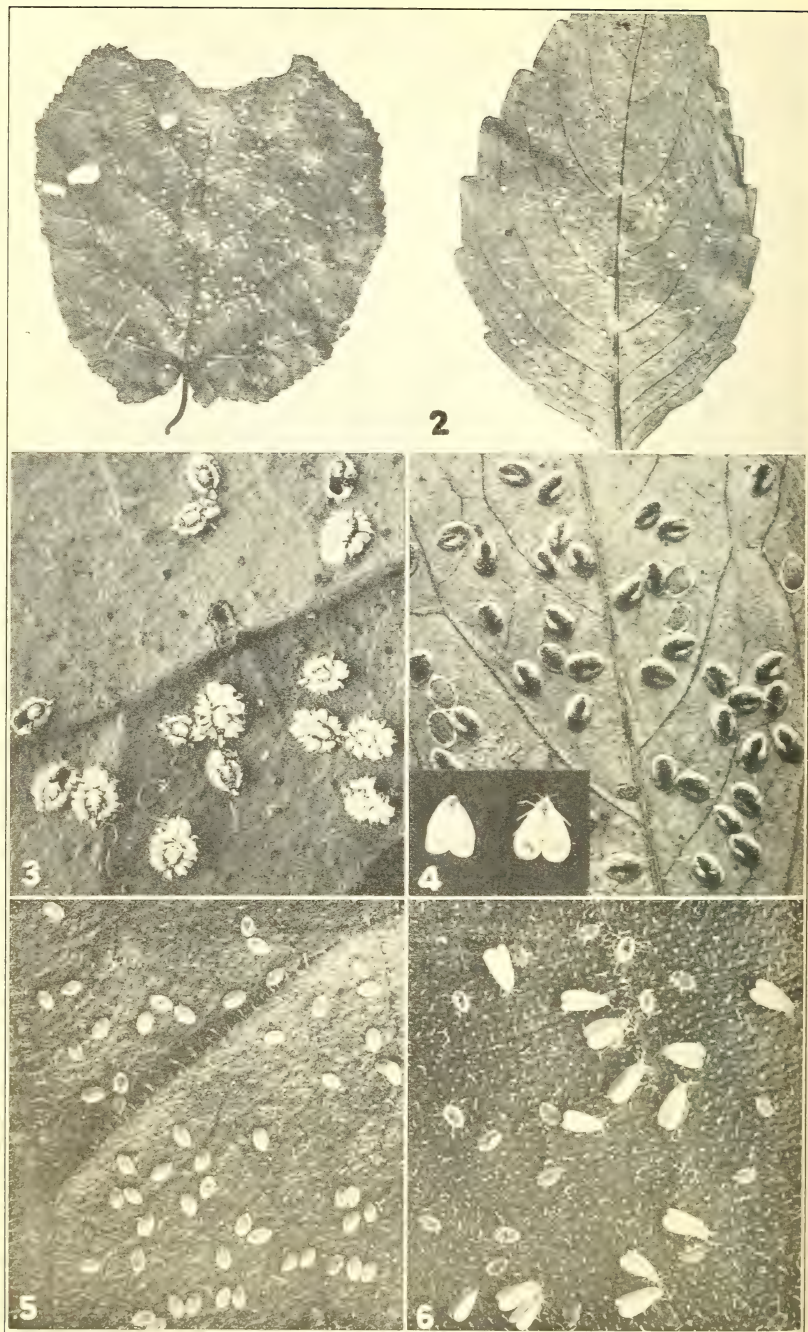


PLATE XII. ALEYRODIDAE.

1. *Trialeurodes coryli* Britton,—larvae, x 1.
2. *Trialeurodes morrilli* Britton,—larvae, x 1.
3. *Aleuroplatus plumosus* Quaintance,—larvae and pupae, x 10.
4. *Aleyrodes asarumis* Shimer,—larvae, pupae and adults, x 4.
5. *Trialeurodes vaporariorum* Westwood,—greenhouse white fly, larvae and pupae, x 4.
6. *Trialeurodes vaporariorum* Westwood,—pupae and adults, x 4.

Photographs: 1 and 2 by W. E. Britton; 3 and 4 by B. H. Walden; 5 and 6 by H. A. Doty.

PLATE XIII. COCCIDAE, SCALE INSECTS.

1. *Orthezia insignis* Douglas,—greenhouse orthezia, x 2.5.
2. *Asterolccanium variolosum* Ratzeburg,—pit-making oak scale,
x 1.
3. *Gossyparia spuria* Modeer,—elm scale, x 1.
4. *Kermes sassceri* King, x 2.
5. *Phenacoccus acericola* King,—woolly maple leaf scale, males
on bark, x 1.
6. *Phenacoccus acericola* King,—females, x 1.
7. *Pseudococcus citri* Risso,—common mealy bug, x 1.
8. *Lecanium corni* Bouché,—European fruit lecanium, x 1.
9. *Pulvinaria vitis* Linnaeus,—cottony maple scale, x 1.

Photographs: 3 and 5 by W. E. Britton; others by B. H. Walden.

PLATE XIII.

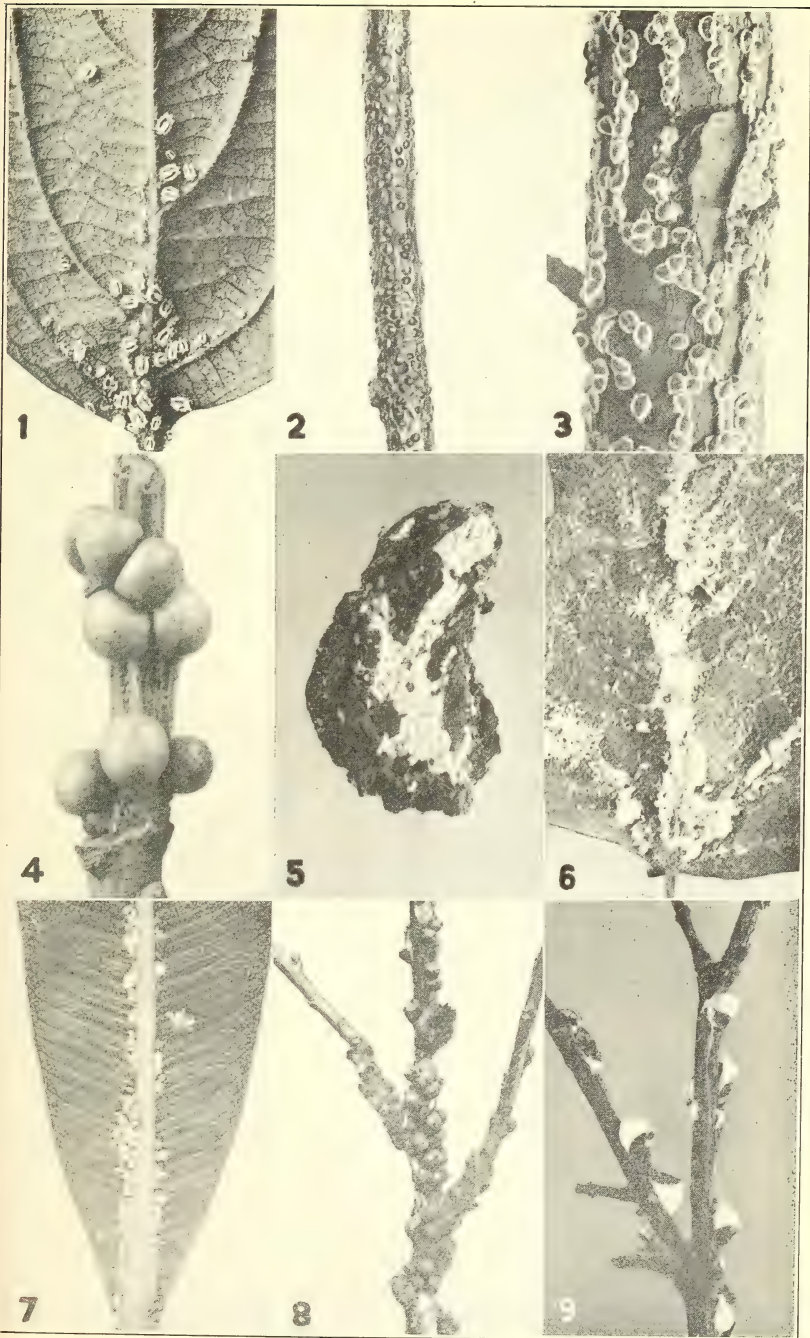


PLATE XIV.

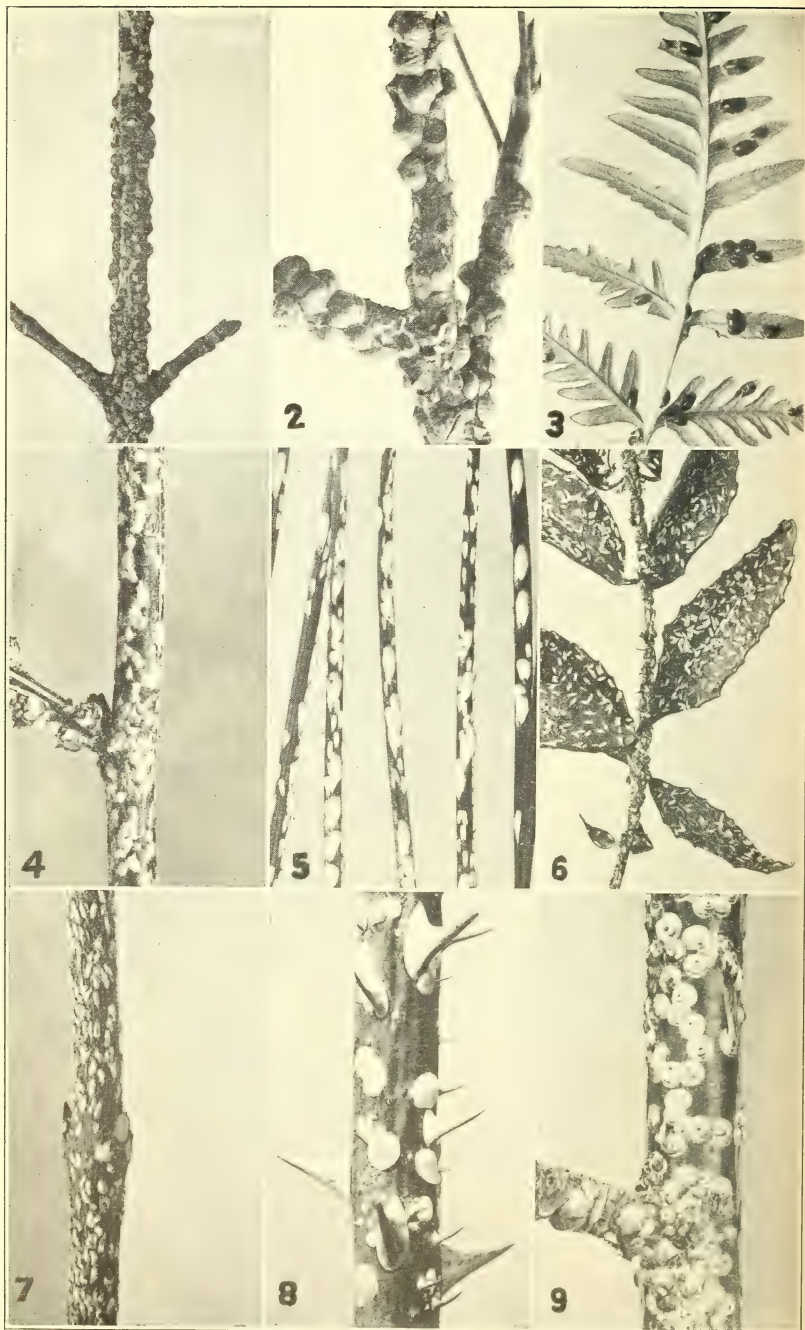


PLATE XIV. COCCIDAE, SCALE INSECTS.

1. *Lecanium nigrofasciatum* Pergande,—terrapin scale, x 1.
2. *Toumeyella liriodendri* Gmelin,—tulip tree scale, x 1.
3. *Saissetia hemisphaerica* Targioni-Tozzetti,—hemispherical scale, x 1.
4. *Chionaspis furfura* Fitch,—scurfy scale, x 1.
5. *Chionaspis pinifoliae* Fitch,—pine leaf scale, x 2.
6. *Chionaspis euonymi* Comstock,—euonymus scale, x 1.
7. *Chionaspis corni* Cooley, x 1.
8. *Aulacaspis rosae* Bouché,—rose scale, x 2.
9. *Aulacaspis pentagona* Targioni-Tozzetti,—West Indian peach scale, x 2.

Photographs: 2 by H. A. Doty; others by B. H. Walden.

PLATE XV. COCCIDAE, SCALE INSECTS.

1. *Diaspis echinocacti* Bouché var. *cacti* Comstock, x 1.
2. *Hemichionaspis aspidistrae* Signoret, x about 3.
3. *Leucaspis japonica* Cockerell, x 1.
4. *Aspidiotus perniciosus* Comstock,—San José scale, x 1.
5. *Aspidiotus hederae* Vallot,—white or oleander scale, x 2.
6. *Chrysomphalus aonidum* Linnaeus,—circular or fig scale, x 1.
7. *Lepidosaphes newsteadi* Sulc, x 4.
8. *Lepidosaphes ulmi* Linnaeus,—oyster-shell scale, x 1.
9. *Ischnaspis longirostris* Signoret,—thread scale, x 2.

Photographs by B. H. Walden.

PLATE XV.

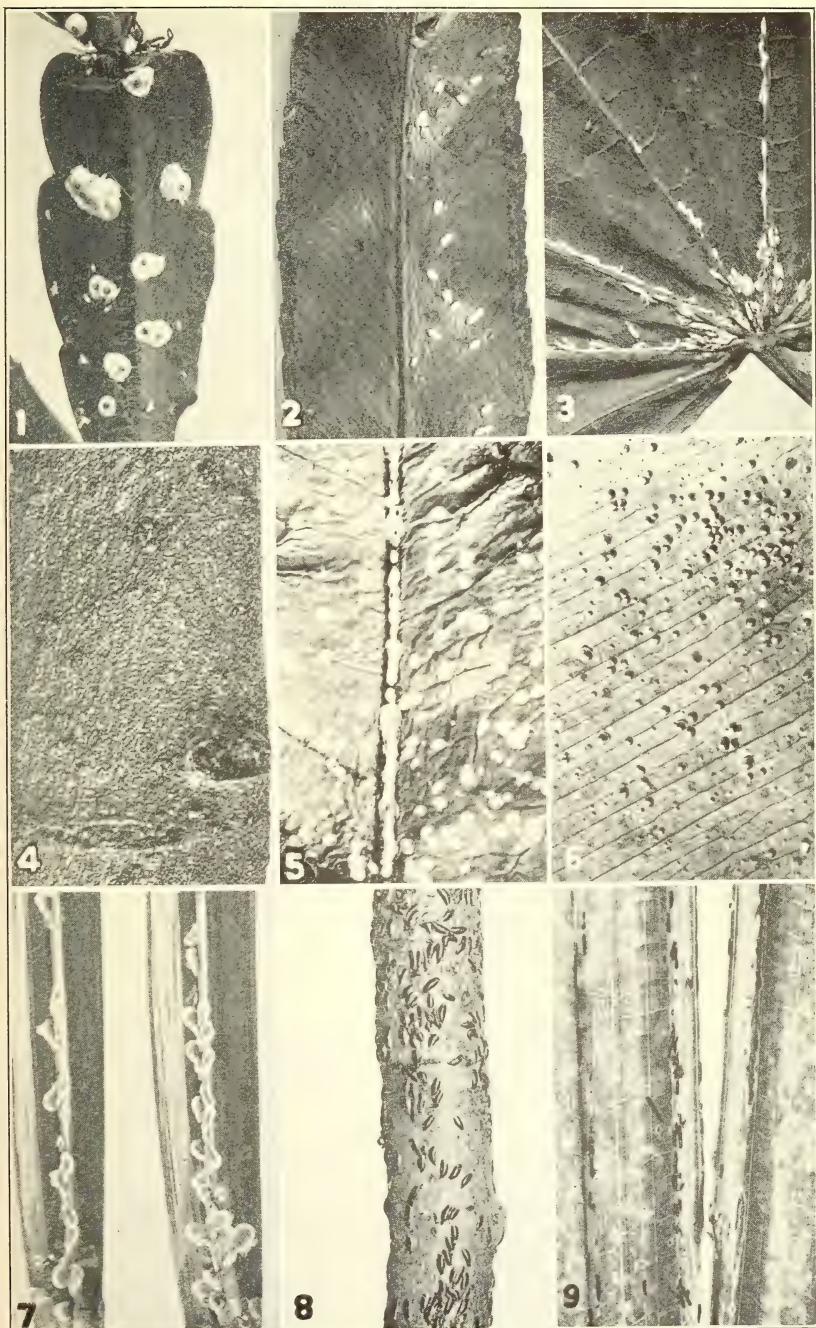


PLATE XVI.

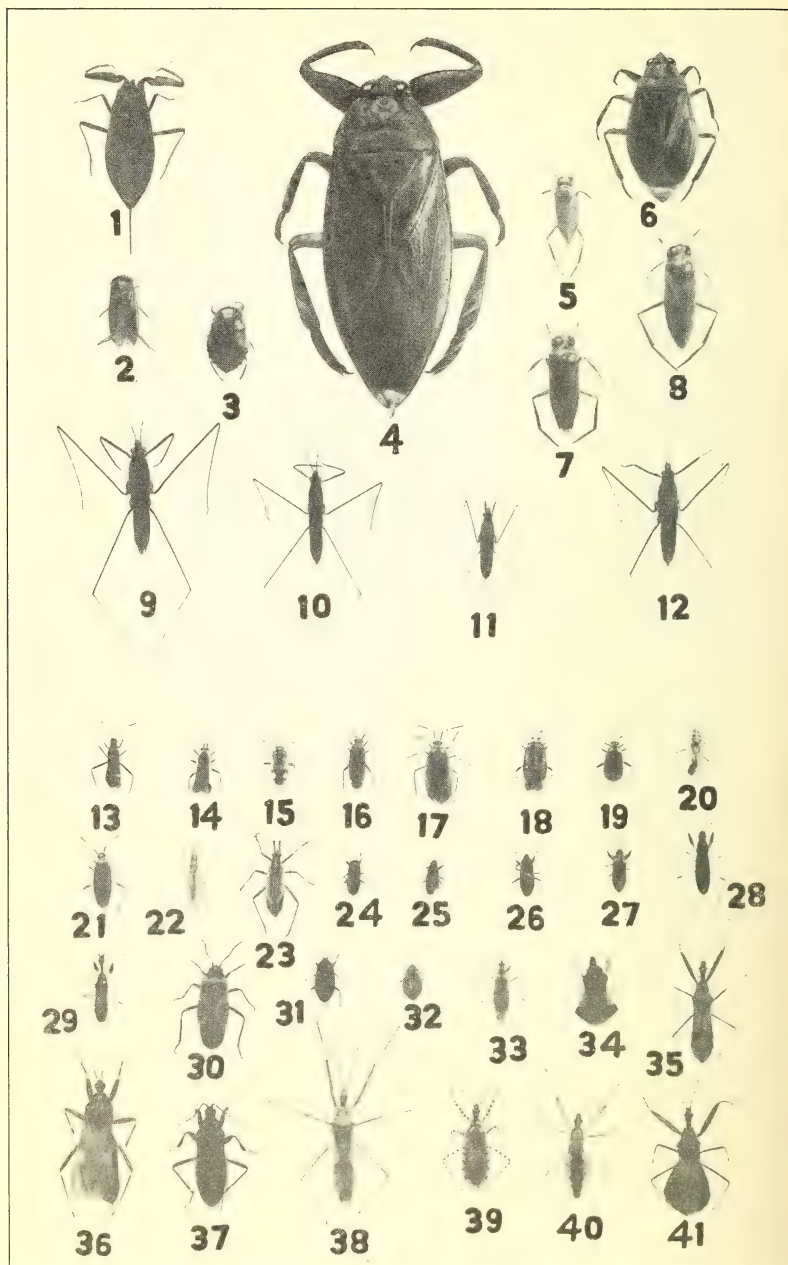


PLATE XVI.

1. *Nepa apiculata* Uhler.
2. *Arctocorixa interrupta* Say.
3. *Pelocoris femoratus* Palisot de Beauvois.
4. *Lethocerus americanus* Leidy.
5. *Notonecta variabilis* Fieber.
6. *Belostoma flumineum* Say.
7. *Notonecta irrorata* Uhler.
8. *Notonecta insulata* Kirby.
9. *Gerris conformis* Uhler.
10. *Gerris rufoscutellatus* Latreille.
11. *Gerris marginatus* Say.
12. *Gerris remigis* Say.
13. *Pseudoxenetes scutellatus* Uhler.
14. *Lopidea robiniae* Uhler.
15. *Lygus pratensis* Linnaeus var. *oblineatus* Say,—tarnished
plant bug.
16. *Lygidea mendax* Reuter.
17. *Coccobaphes sanguinarius* Uhler.
18. *Poecilocapsus lineatus* Fabricius,—four-lined leaf bug.
19. *Horcias dislocatus* Say.
20. *Stenotus binotatus* Fabricius.
21. *Adelphocoris rapidus* Say.
22. *Stenodema trispinosum* Reuter.
23. *Miris dolabratus* Linnaeus.
24. *Phlegyas abbreviatus* Uhler.
25. *Nysius ericae* Schilling.
26. *Eremocoris ferus* Say.
27. *Oedancala dorsalis* Say.
28. *Cnemodus mavortius* Say.
29. *Myodocha serripes* Olivier.
30. *Lygaeus kalmii* Stål.
31. *Emblethis vicarius* Horvath.
32. *Cimex lectularius* Linnaeus.
33. *Nabis ferus* Linnaeus.
34. *Phymata erosa* Linnaeus.
35. *Sinea diadema* Fabricius.
36. *Reduvius personatus* Linnaeus.
37. *Melanolestes abdominalis* Herrich-Schaeffer.
38. *Zelus exsanguis* Stål.
39. *Pselliopus cinctus* Fabricius.
40. *Fitchia aptera* Stål.
41. *Acholla multispinosa* DeGeer.

All natural size. Photographs by B. H. Walden.

PLATE XVII. REDUVIIDAE AND TINGIDAE.

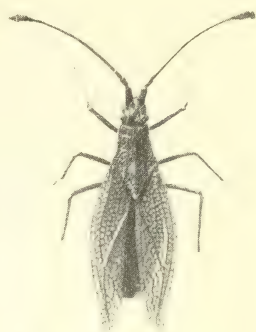
1. *Emesa brevipennis* Say, x 1.
2. *Piesma cinera* Say, x 8.
3. *Melanorhopala clavata* Stål, x 8.
4. *Physatocheila*, x 8.
5. *Gelchossa heidemanni* Osborn and Drake, x 8.
6. *Corythucha marmorata* Uhler, x 8.
7. *Gargaphia angulata* Heidemann, x 8.
8. *Stephanitis pyrioides* Scott, x 8.

Photographs by B. H. Walden.

PLATE XVII.



2



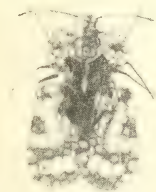
3



4



5



6



7



8

PLATE XVIII.

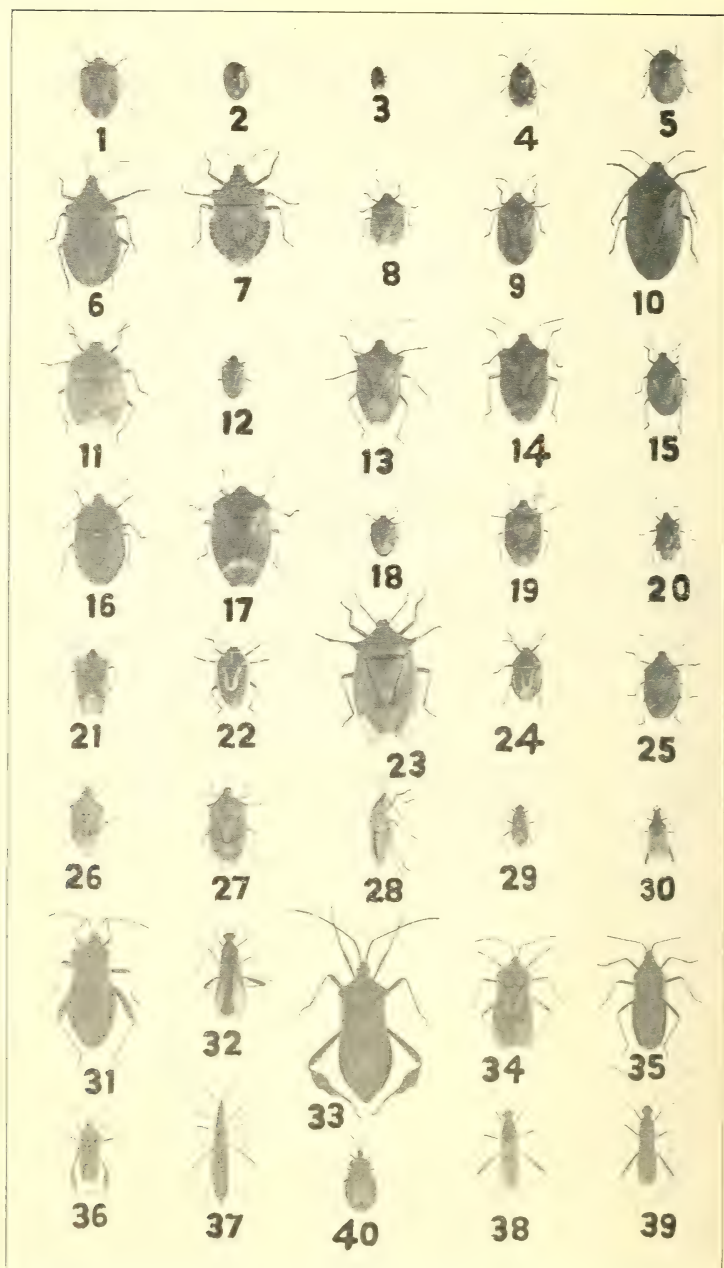


PLATE XVIII.

1. *Homaemus aeneifrons* Say.
2. *Galgupha atra* Amyot and Serville.
3. *Aminestus spinifrons* Say.
4. *Sehirus cinctus* Palisot de Beauvois.
5. *Eurygaster alternata* Say.
6. *Brochymena quadripustulata* Fabricius.
7. *Brochymena arborea* Say.
8. *Peribalus limbolarius* Say.
9. *Rhytidolomia saucia* Say.
10. *Rhytidolomia senilis* Say.
11. *Chlorochroa uhleri* Stål.
12. *Mormidea lugens* Fabricius.
13. *Euschistus variolarius* Palisot de Beauvois.
14. *Euschistus euschistoides* Vollenhoven.
15. *Coenus delius* Say.
16. *Meneclis insertus* Say.
17. *Acrosternum hilare* Say.
18. *Cosmopepla bimaculata* Thomas.
19. *Banasa dimidiata* Say.
20. *Meadorus lateralis* Say.
21. *Elasmotethus cruciatus* Say.
22. *Perillus circumcinctus* Stål.
23. *Apateticus cynicus* Say.
24. *Perillus exaptus* Say.
25. *Podisus placidus* Uhler.
26. *Podisus modestus* Dallas.
27. *Podisus maculiventris* Say,—dorsal view.
28. *Podisus maculiventris* Say,—lateral view.
29. *Corizus lateralis* Say.
30. *Harmostes reflexulus* Stål.
31. *Euthochtha galeator* Fabricius.
32. *Megalotomus quinquespinosus* Say.
33. *Acanthocephala terminalis* Dallas.
34. *Anasa repetita* Heidemann.
35. *Anasa tristis* DeGeer,—squash bug.
36. *Merocoris distinctus* Dallas.
37. *Protenor belfragei* Haglund.
38. *Alydus pilosulus* Herrich-Schaeffer.
39. *Alydus eurinus* Say.
40. *Aradus quadrilineatus* Say.

All natural size. Photographs by B. H. Walden.

PLATE XIX. HEMIPTEROUS EGGS.

1. Eggs of *Acholla multispinosa* DeGeer, on apple, x 2.
2. Egg scars of *Tibicina septendecim* Linnaeus, x 1.
3. Eggs of the squash bug, *Anasa tristis* DeGeer, on squash leaf,
x 1.
4. *Belostoma lutarium* Stål,—eggs on back of male, x 1.
5. *Ceresa bubalus* Fabricius,—egg scars in apple twigs, x 1.
6. Eggs of *Lethocerus* sp., x 1.
7. Eggs of *Podisus* sp., x 1.
8. Eggs of oyster-shell scale, *Lepidosaphes ulmi* Linnaeus,
under shell of female, x 6.
9. Eggs of green apple aphid, *Aphis pomi* DeGeer, on apple
twig, x 2.
10. Eggs of *Dilachnus strobi* Fitch, on white pine, x 1.

Photographs by B. H. Walden.

PLATE XIX.

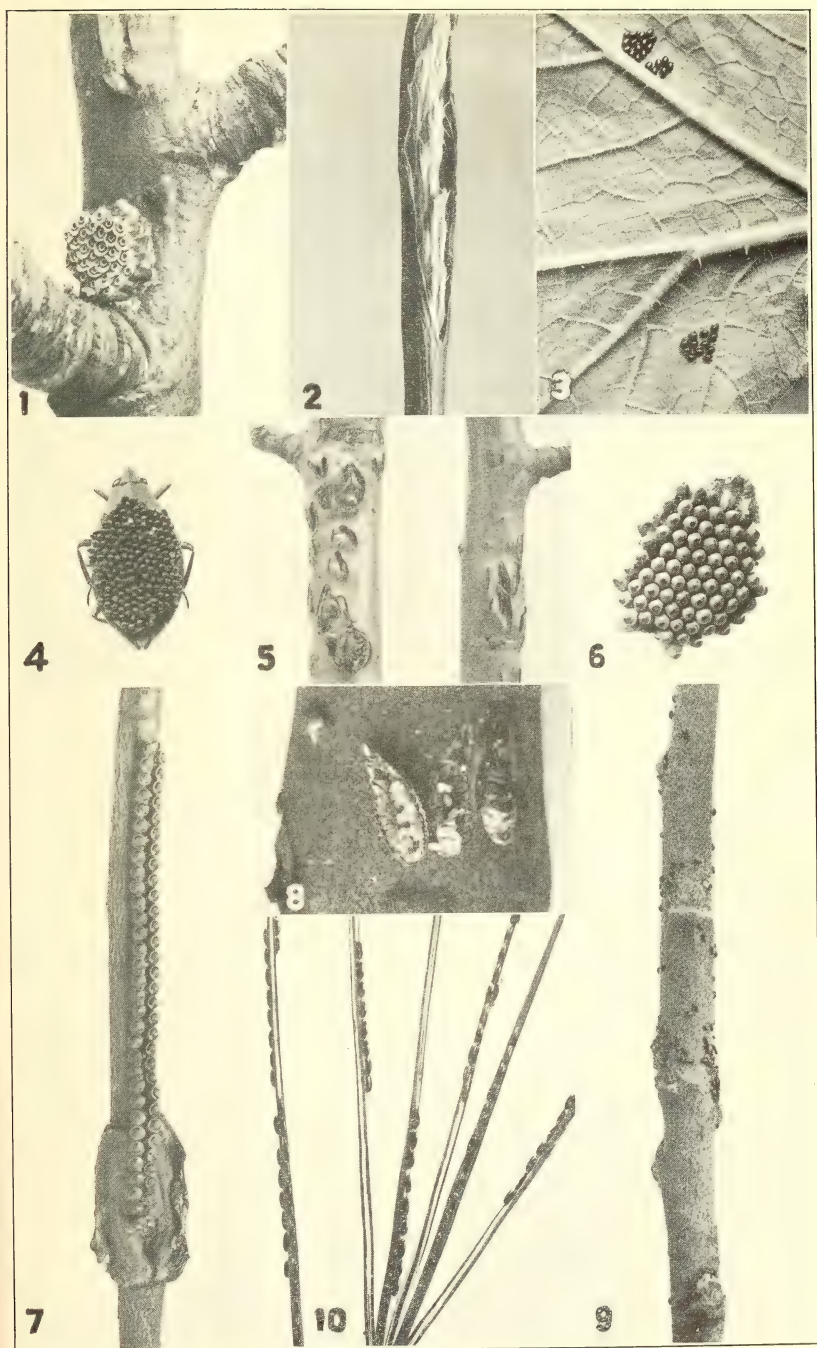


PLATE XX.

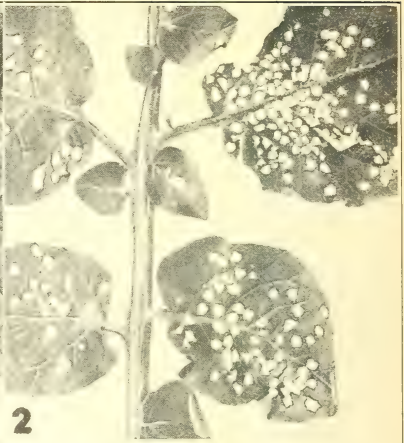


PLATE XX. INJURY CAUSED BY HEMIPTERA.

1. Work of leafhoppers on currant leaf.
2. Potato leaf injured by *Poecilocapsus lineatus* Fabricius.
3. Injury to pears by *Lygus pratensis* Linnaeus.
4. *Podisus placidus* Uhler feeding on currant worm, x 2.
5. Apple leaves curled by the light red bug, *Lygidea mendax* Reuter.
6. Froth mass of *Aphrophora parallela* Say.

All others natural size. Photographs by B. H. Walden.

BULLETINS

OF THE

State Geological and Natural History Survey of Connecticut

1. First Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1903-1904.

2. A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut: by Herbert William Conn. (Out of print. To be obtained only in Vol. I, containing Bulletins 1-5. Price \$1.50, postpaid.)

3. A Preliminary Report on the Hymeniales of Connecticut: by Edward Albert White.

4. The Clays and Clay Industries of Connecticut: by Gerald Francis Loughlin.

5. The Ustilagineæ, or Smuts, of Connecticut: by George Perkins Clinton.

6. Manual of the Geology of Connecticut: by William North Rice and Herbert Ernest Gregory. (Out of print. To be obtained only in Vol. II, containing Bulletins 6-12. Price \$2.45, postpaid.)

7. Preliminary Geological Map of Connecticut: by Herbert Ernest Gregory and Henry Hollister Robinson.

8. Bibliography of Connecticut Geology: by Herbert Ernest Gregory.

9. Second Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1905-1906.

10. A Preliminary Report on the Algæ of the Fresh Waters of Connecticut: by Herbert William Conn and Lucia Washburn (Hazen) Webster.

11. The Bryophytes of Connecticut: by Alexander William Evans and George Elwood Nichols.

12. Third Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1907-1908.

13. The Lithology of Connecticut: by Joseph Barrell and Gerald Francis Loughlin.

14. Catalogue of the Flowering Plants and Ferns of Connecticut growing without cultivation: by a committee of the Connecticut Botanical Society.

15. Second Report on the Hymeniales of Connecticut: by Edward Albert White.

16. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part I. General Introduc-

tion: by Wilton Everett Britton. Part II. The Euplexoptera and Orthoptera of Connecticut: by Benjamin Hovey Walden.

17. Fourth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1909-10.

18. Triassic Fishes of Connecticut: by Charles Rochester Eastman.

19. Echinoderms of Connecticut: by Wesley Roscoe Coe.

20. The Birds of Connecticut: by John Hall Sage and Louis Bennett Bishop, assisted by Walter Parks Bliss.

21. Fifth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1911-1912.

22. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton. Part III. The Hymenoptera, or Wasp-like Insects, of Connecticut: by Henry Lorenz Viereck, with the collaboration of Alexander Dyer MacGillivray, Charles Thomas Brues, William Morton Wheeler, and Sievert Allen Rohwer.

23. Central Connecticut in the Geologic Past: by Joseph Barrell.

24. Triassic Life of the Connecticut Valley: by Richard Swann Lull.

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33. Geology of the Stonington Region, Connecticut: by Laura Hatch, Ph.D. (In press.)

34. Guide to the Insects of Connecticut: prepared under the direction of Wilton Everett Britton, Ph.D. Part IV. The Hemiptera or Sucking Insects of Connecticut: by Wilton Everett Britton, Ph.D., with the collaboration of James Francis Abbott, Arthur Challen Baker, Harry Gardner Barber, William Thompson Davis, Dwight Moore Delong, William Delbert Funkhouser, Harry Hazleton Knight, Asa Chandler Maxson, Herbert Osborn, Howard Madison Parshley, Edith Marion Patch, Louis Agassiz Stearns, José Rollin de la Torre-Bueno, Edward Payson Van Duzee, Harley Frost Wilson.

35. Tenth Biennial Report of the Commissioners of the State Geological and Natural History Survey, 1921-1922. (In press.)

Bulletins 1, 9, 12, 17, 21, 25, 27, 28, 32 and 35 are administrative reports containing no scientific matter. The other bulletins may be classified as follows:

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Bulletin 484. The Granites of Connecticut: by T. Nelson Dale and Herbert E. Gregory.

Water-Supply Paper 374. Ground Water in the Hartford, Stamford, Salisbury, Willimantic and Saybrook Areas, Connecticut: by Herbert E. Gregory and Arthur J. Ellis.

Water-Supply Paper 397. Ground Water in the Waterbury Area, Connecticut: by Arthur J. Ellis, under the direction of Herbert E. Gregory.

These papers may be obtained from the Director of the United States Geological Survey at Washington.

CATALOGUE SLIPS

Connecticut. State geological and natural history survey.

Bulletin No. 34. Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut. By W. E. Britton, with the collaboration of J. F. Abbott, A. C. Baker, H. G. Barber, W. T. Davis, D. M. DeLong, W. D. Funkhouser, H. H. Knight, A. C. Maxson, H. Osborn, H. M. Parshley, E. M. Patch, L. A. Stearns, J. R. de la Torre-Bueno, E. P. Van Duzee and H. F. Wilson. Hartford, 1923.

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Britton, Wilton Everett, 1868.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton, editor and author of families Aleyrodidae and Coccidae, pp. 335-382. Part IV. The Hemiptera or sucking insects of Connecticut. By W. E. Britton, with the collaboration of J. F. Abbott, A. C. Baker, H. G. Barber, W. T. Davis, D. M. DeLong, W. D. Funkhouser, H. H. Knight, A. C. Maxson, H. Osborn, H. M. Parshley, E. M. Patch, L. A. Stearns, J. R. de la Torre-Bueno, E. P. Van Duzee and H. F. Wilson. Hartford, 1923.

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Abbott, James Francis, 1876.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Corixidae, pp. 386-390, Hartford, 1923.

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Baker, Arthur Challen, 1885.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Aphididae (Tribe Callipterini), pp. 271-290, Hartford, 1923.

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Barber, Harry Gardner, 1871.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Lygaeidae, pp. 708-737, Hartford, 1923.

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Davis, William Thompson, 1862.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Cicadidae, pp. 238-242, Hartford, 1923.

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DeLong, Dwight Moore, 1892.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Cicadellidae, pp. 56-163, Hartford, 1923.

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Funkhouser, William Delbert, 1881.

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Knight, Harry Hazleton, 1889.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: family Miridae, pp. 422-658, Hartford, 1923.

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Maxson, Asa Chandler, 1875.

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Osborn, Herbert, 1856.

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Parshley, Howard Madison, 1884.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: keys to families of Heteroptera, pp. 383-385, families Teratophylidae, Anchoridae, Cimicidae and Nabidae, pp. 665-674, Phymatidae, Enicocephalidae, Piesmididae and Tingidae, pp. 692-707, Neididae, Aradidae, Coreidae, Alydidae, Corizidae, Pentatomidae, Cydnidae and Scutelleridae, pp. 737-783, Hartford, 1923.

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Patch, Edith Marion, 1876.

Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut: families Psyllidae, Aphididae (in part) and Chermesidae, pp. 243-256, 290-311, 329-335, Hartford, 1923.

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Stearns, Louis Agassiz, 1892.

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Torre-Bueno, José Rollin de la, 1871.

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Van Duzee, Edward Payson, 1861.

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Wilson, Harley Frost, 1883.

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Britton, W. E., Abbott, J. F., Baker, A. C., Barber, H. G., Davis, W. T., DeLong, D. M., Funkhouser, W. D., Knight, H. H., Maxson, A. C., Osborn, H., Parshley, H. M., Patch, E. M., Stearns, L. A., Torre-Bueno, J. R., Van Duzee, E. P., and Wilson, H. F. Guide to the insects of Connecticut. Prepared under the direction of W. E. Britton. Part IV. The Hemiptera or sucking insects of Connecticut, Hartford, 1923.

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